# Sech



## Notations

### Traditional name

Hyperbolic secant

### Traditional notation

$\operatorname{sech}(z)$

### *Mathematica* StandardForm notation

`Sech[z]`

## Primary definition

01.24.02.0001.01

$$\operatorname{sech}(z) = \frac{1}{\cosh(z)} = \frac{2}{e^z + e^{-z}}$$

## Specific values

### Specialized values

01.24.03.0001.01

$$\operatorname{sech}\left(\pi i \left(\frac{1}{2} + m\right)\right) = \tilde{\infty} \;/;\; m \in \mathbb{Z}$$

01.24.03.0002.01

$$\operatorname{sech}(\pi\, i\, m) = (-1)^m \;/;\; m \in \mathbb{Z}$$

### Values at fixed points

01.24.03.0003.01

$$\operatorname{sech}(0) = 1$$

01.24.03.0004.01

$$\operatorname{sech}\left(\frac{\pi i}{12}\right) = \sqrt{6} - \sqrt{2}$$

01.24.03.0005.01

$$\operatorname{sech}\left(\frac{\pi i}{12}\right) = \left(z;\, z^4 - 16 z^2 + 16\right)_3^{-1}$$

01.24.03.0006.01

$$\operatorname{sech}\left(\frac{\pi i}{10}\right) = \sqrt{2 - \frac{2}{\sqrt{5}}}$$

01.24.03.0007.01

$$\operatorname{sech}\left(\frac{\pi i}{10}\right) = \left(z;\, 5 z^4 - 20 z^2 + 16\right)_3^{-1}$$

01.24.03.0008.01

$$\operatorname{sech}\left(\frac{\pi i}{9}\right) = -\frac{4 \sqrt[3]{2}}{\left(-1 + i \sqrt{3}\right)^{4/3} + \left(-1 - i \sqrt{3}\right)^{4/3}}$$

01.24.03.0009.01

$$\operatorname{sech}\left(\frac{\pi i}{9}\right) = \left(z;\, z^3 + 6 z^2 - 8\right)_3^{-1}$$

01.24.03.0010.01

$$\operatorname{sech}\left(\frac{\pi i}{9}\right) = \frac{2 \sqrt[9]{-1}}{1 + (-1)^{2/9}}$$

01.24.03.0011.01

$$\operatorname{sech}\left(\frac{\pi i}{8}\right) = \frac{2}{\sqrt{2 + \sqrt{2}}}$$

01.24.03.0012.01

$$\operatorname{sech}\left(\frac{\pi i}{8}\right) = \left(z;\, z^4 - 8 z^2 + 8\right)_3^{-1}$$

01.24.03.0013.01

$$\operatorname{sech}\left(\frac{\pi i}{8}\right) = \frac{2 \sqrt[8]{-1}}{1 + \sqrt[4]{-1}}$$

01.24.03.0014.01

$$\operatorname{sech}\left(\frac{\pi i}{7}\right) = 24 \Bigg/ \left(2 \left(1 - i \sqrt{3}\right) \sqrt[3]{7 + \frac{i \sqrt{7}}{2} + \frac{3 \sqrt{21}}{2}} + \frac{2 \sqrt{7} \left(-i + \sqrt{3}\right)}{\sqrt[3]{7 + \frac{i \sqrt{7}}{2} + \frac{3 \sqrt{21}}{2}}} + \frac{2 \sqrt{7} \left(i + \sqrt{3}\right)}{\sqrt[3]{7 - \frac{i \sqrt{7}}{2} - \frac{3 \sqrt{21}}{2}}} + \sqrt[3]{7 - \frac{i \sqrt{7}}{2} - \frac{3 \sqrt{21}}{2}} \left(2 + 2 i \sqrt{3}\right) + 4\right)$$

01.24.03.0015.01

$$\operatorname{sech}\left(\frac{\pi i}{7}\right) = \left(z;\, z^3 - 4 z^2 - 4 z + 8\right)_2^{-1}$$

01.24.03.0016.01

$$\operatorname{sech}\left(\frac{\pi i}{7}\right) = \frac{2\sqrt[7]{-1}}{1+(-1)^{2/7}}$$

01.24.03.0017.01

$$\operatorname{sech}\left(\frac{\pi i}{6}\right) = \frac{2}{\sqrt{3}}$$

01.24.03.0018.01

$$\operatorname{sech}\left(\frac{\pi i}{5}\right) = \sqrt{5} - 1$$

01.24.03.0019.01

$$\operatorname{sech}\left(\frac{2\pi i}{9}\right) = \frac{2\sqrt[3]{2}}{\sqrt[3]{-1+i\sqrt{3}} + \sqrt[3]{-1-i\sqrt{3}}}$$

01.24.03.0020.01

$$\operatorname{sech}\left(\frac{2\pi i}{9}\right) = \left(z;\, z^3 - 6z^2 + 8\right)_2^{-1}$$

01.24.03.0021.01

$$\operatorname{sech}\left(\frac{2\pi i}{9}\right) = \frac{2(-1)^{2/9}}{1+(-1)^{4/9}}$$

01.24.03.0022.01

$$\operatorname{sech}\left(\frac{\pi i}{4}\right) = \sqrt{2}$$

01.24.03.0023.01

$$\operatorname{sech}\left(\frac{2\pi i}{7}\right) = \frac{3\, 2^{2/3}\sqrt[3]{7-21 i\sqrt{3}}}{-\sqrt[3]{\frac{7}{2}\left(1-3i\sqrt{3}\right)} + \left(\frac{7}{2}\left(1-3i\sqrt{3}\right)\right)^{2/3} + 7}$$

01.24.03.0024.01

$$\operatorname{sech}\left(\frac{2\pi i}{7}\right) = \left(z;\, z^3 + 4z^2 - 4z - 8\right)_3^{-1}$$

01.24.03.0025.01

$$\operatorname{sech}\left(\frac{2\pi i}{7}\right) = \frac{2(-1)^{2/7}}{1+(-1)^{4/7}}$$

01.24.03.0026.01

$$\operatorname{sech}\left(\frac{3\pi i}{10}\right) = \sqrt{2 + \frac{2}{\sqrt{5}}}$$

01.24.03.0027.01

$$\operatorname{sech}\left(\frac{3\pi i}{10}\right) = \left(z;\, 5z^4 - 20z^2 + 16\right)_4^{-1}$$

01.24.03.0028.01

$$\operatorname{sech}\left(\frac{\pi i}{3}\right) = 2$$

01.24.03.0029.01

$$\operatorname{sech}\left(\frac{3\pi i}{8}\right) = \sqrt{2\left(2+\sqrt{2}\right)}$$

01.24.03.0030.01

$$\operatorname{sech}\left(\frac{3\pi i}{8}\right) = \left(z;\, z^4 - 8z^2 + 8\right)_4^{-1}$$

01.24.03.0031.01

$$\operatorname{sech}\left(\frac{3\pi i}{8}\right) = \frac{2(-1)^{3/8}}{1+(-1)^{3/4}}$$

01.24.03.0032.01

$$\operatorname{sech}\left(\frac{2\pi i}{5}\right) = 1 + \sqrt{5}$$

01.24.03.0033.01

$$\operatorname{sech}\left(\frac{5\pi i}{12}\right) = \sqrt{6} + \sqrt{2}$$

01.24.03.0034.01

$$\operatorname{sech}\left(\frac{5\pi i}{12}\right) = \left(z;\, z^4 - 16z^2 + 16\right)_4^{-1}$$

01.24.03.0035.01

$$\operatorname{sech}\left(\frac{3\pi i}{7}\right) = \left(12\, 2^{2/3} \sqrt[3]{7 - 21 i \sqrt{3}}\right) \Big/ \left(-4 i \sqrt{7} \sqrt[3]{7 + \frac{i\sqrt{7}}{2} + \frac{3\sqrt{21}}{2}} - 2\sqrt{7}\left(i+\sqrt{3}\right)\sqrt[3]{7 - \frac{i\sqrt{7}}{2} - \frac{3\sqrt{21}}{2}} + 2\, 2^{2/3} \sqrt[3]{7 - 21 i \sqrt{3}} - 2\left(14 - i\sqrt{7} - 3\sqrt{21}\right)^{2/3} \sqrt[3]{14 + i\sqrt{7} + 3\sqrt{21}} + \left(14 + i\sqrt{7} + 3\sqrt{21}\right)^{2/3} \sqrt[3]{14 - i\sqrt{7} - 3\sqrt{21}} + \sqrt{3}\left(14 + i\sqrt{7} + 3\sqrt{21}\right)^{2/3} \sqrt[3]{14 - i\sqrt{7} - 3\sqrt{21}}\, i\right)$$

01.24.03.0036.01

$$\operatorname{sech}\left(\frac{3\pi i}{7}\right) = \left(z;\, z^3 - 4z^2 - 4z + 8\right)_3^{-1}$$

01.24.03.0037.01

$$\operatorname{sech}\left(\frac{3\pi i}{7}\right) = \frac{2(-1)^{3/7}}{1+(-1)^{6/7}}$$

01.24.03.0038.01

$$\operatorname{sech}\left(\frac{4\pi i}{9}\right) = \frac{4 i \sqrt[3]{2}}{\sqrt[3]{-1 + i\sqrt{3}}\left(-i+\sqrt{3}\right) - \sqrt[3]{-1 - i\sqrt{3}}\left(i+\sqrt{3}\right)}$$

01.24.03.0039.01

$$\operatorname{sech}\left(\frac{4\pi i}{9}\right) = \left(z;\, z^3 - 6z^2 + 8\right)_3^{-1}$$

01.24.03.0040.01

$$\operatorname{sech}\left(\frac{4\pi i}{9}\right) = \frac{2(-1)^{4/9}}{1+(-1)^{8/9}}$$

01.24.03.0041.01

$$\operatorname{sech}\left(\frac{\pi i}{2}\right) = \tilde{\infty}$$

01.24.03.0042.01

$$\operatorname{sech}\left(\frac{5\pi i}{9}\right) = -\frac{4\,i\,\sqrt[3]{2}}{\sqrt[3]{-1+i\sqrt{3}}\,\left(-i+\sqrt{3}\right)-\sqrt[3]{-1-i\sqrt{3}}\,\left(i+\sqrt{3}\right)}$$

01.24.03.0043.01

$$\operatorname{sech}\left(\frac{5\pi i}{9}\right) = \left(z;\, z^3+6z^2-8\right)_1^{-1}$$

01.24.03.0044.01

$$\operatorname{sech}\left(\frac{5\pi i}{9}\right) = -\frac{2(-1)^{5/9}}{-1+\sqrt[9]{-1}}$$

01.24.03.0045.01

$$\operatorname{sech}\left(\frac{4\pi i}{7}\right) = -\left(6\,2^{2/3}\,\sqrt[3]{7-21\,i\sqrt{3}}\right)\Big/\left(2^{2/3}\,\sqrt[3]{7-21\,i\sqrt{3}}-i\sqrt{3}\left(\frac{7}{2}-\frac{21\,i\sqrt{3}}{2}\right)^{2/3}+\left(\frac{7}{2}\left(1-3\,i\sqrt{3}\right)\right)^{2/3}+7\sqrt{3}\,i+7\right)$$

01.24.03.0046.01

$$\operatorname{sech}\left(\frac{4\pi i}{7}\right) = \left(z;\, z^3+4z^2-4z-8\right)_1^{-1}$$

01.24.03.0047.01

$$\operatorname{sech}\left(\frac{4\pi i}{7}\right) = -\frac{2(-1)^{4/7}}{-1+\sqrt[7]{-1}}$$

01.24.03.0048.01

$$\operatorname{sech}\left(\frac{7\pi i}{12}\right) = -\sqrt{6}-\sqrt{2}$$

01.24.03.0049.01

$$\operatorname{sech}\left(\frac{7\pi i}{12}\right) = \left(z;\, z^4-16z^2+16\right)_1^{-1}$$

01.24.03.0050.01

$$\operatorname{sech}\left(\frac{3\pi i}{5}\right) = -1-\sqrt{5}$$

01.24.03.0051.01

$$\operatorname{sech}\left(\frac{5\pi i}{8}\right) = -\sqrt{2\left(2+\sqrt{2}\right)}$$

01.24.03.0052.01

$$\operatorname{sech}\left(\frac{5\pi i}{8}\right) = \left(z;\, z^4-8z^2+8\right)_1^{-1}$$

01.24.03.0053.01

$$\operatorname{sech}\left(\frac{5\pi i}{8}\right) == -\frac{2(-1)^{5/8}}{-1+\sqrt[4]{-1}}$$

01.24.03.0054.01

$$\operatorname{sech}\left(\frac{2\pi i}{3}\right) == -2$$

01.24.03.0055.01

$$\operatorname{sech}\left(\frac{7\pi i}{10}\right) == -\sqrt{2+\frac{2}{\sqrt{5}}}$$

01.24.03.0056.01

$$\operatorname{sech}\left(\frac{7\pi i}{10}\right) == \left(z;\, 5z^4-20z^2+16\right)_1^{-1}$$

01.24.03.0057.01

$$\operatorname{sech}\left(\frac{5\pi i}{7}\right) == \left(12\, 2^{2/3}\sqrt[3]{7-21 i\sqrt{3}}\right)\Big/\left(2\sqrt{7}\, i\sqrt[3]{7+\frac{i\sqrt{7}}{2}+\frac{3\sqrt{21}}{2}}-2\sqrt{21}\sqrt[3]{7+\frac{i\sqrt{7}}{2}+\frac{3\sqrt{21}}{2}}+2\, 2^{2/3}\sqrt[3]{7-21 i\sqrt{3}}-\right.$$
$$i\sqrt{3}\left(14-i\sqrt{7}-3\sqrt{21}\right)^{2/3}\sqrt[3]{14+i\sqrt{7}+3\sqrt{21}}-2\sqrt[3]{14-i\sqrt{7}-3\sqrt{21}}\left(14+i\sqrt{7}+3\sqrt{21}\right)^{2/3}+$$
$$\left.\sqrt[3]{14+i\sqrt{7}+3\sqrt{21}}\left(14-i\sqrt{7}-3\sqrt{21}\right)^{2/3}+4\sqrt{7}\sqrt[3]{7-\frac{i\sqrt{7}}{2}-\frac{3\sqrt{21}}{2}}\; i\right)$$

01.24.03.0058.01

$$\operatorname{sech}\left(\frac{5\pi i}{7}\right) == \left(z;\, z^3-4z^2-4z+8\right)_1^{-1}$$

01.24.03.0059.01

$$\operatorname{sech}\left(\frac{5\pi i}{7}\right) == -\frac{2(-1)^{5/7}}{-1+(-1)^{3/7}}$$

01.24.03.0060.01

$$\operatorname{sech}\left(\frac{3\pi i}{4}\right) == -\sqrt{2}$$

01.24.03.0061.01

$$\operatorname{sech}\left(\frac{7\pi i}{9}\right) == -\frac{2\sqrt[3]{2}}{\sqrt[3]{-1+i\sqrt{3}}+\sqrt[3]{-1-i\sqrt{3}}}$$

01.24.03.0062.01

$$\operatorname{sech}\left(\frac{7\pi i}{9}\right) == \left(z;\, z^3+6z^2-8\right)_2^{-1}$$

01.24.03.0063.01

$$\operatorname{sech}\left(\frac{7\pi i}{9}\right) = -\frac{2(-1)^{7/9}}{-1+(-1)^{5/9}}$$

01.24.03.0064.01

$$\operatorname{sech}\left(\frac{4\pi i}{5}\right) = 1-\sqrt{5}$$

01.24.03.0065.01

$$\operatorname{sech}\left(\frac{5\pi i}{6}\right) = -\frac{2}{\sqrt{3}}$$

01.24.03.0066.01

$$\operatorname{sech}\left(\frac{6\pi i}{7}\right) = -\left(12\, 2^{2/3} \sqrt[3]{7-21 i\sqrt{3}}\right) \Big/ \left(2\, 2^{2/3} \sqrt[3]{7-21 i\sqrt{3}} + \sqrt[3]{2}\left(7-21 i\sqrt{3}\right)^{2/3} + 2\sqrt{3}\left(\frac{7}{2}-\frac{21 i\sqrt{3}}{2}\right)^{2/3} i - 14 i\sqrt{3} + 14\right)$$

01.24.03.0067.01

$$\operatorname{sech}\left(\frac{6\pi i}{7}\right) = \left(z;\, z^3+4z^2-4z-8\right)_2^{-1}$$

01.24.03.0068.01

$$\operatorname{sech}\left(\frac{6\pi i}{7}\right) = -\frac{2(-1)^{6/7}}{-1+(-1)^{5/7}}$$

01.24.03.0069.01

$$\operatorname{sech}\left(\frac{7\pi i}{8}\right) = -\frac{2}{\sqrt{2+\sqrt{2}}}$$

01.24.03.0070.01

$$\operatorname{sech}\left(\frac{7\pi i}{8}\right) = \left(z;\, z^4-8z^2+8\right)_2^{-1}$$

01.24.03.0071.01

$$\operatorname{sech}\left(\frac{7\pi i}{8}\right) = -\frac{2(-1)^{7/8}}{-1+(-1)^{3/4}}$$

01.24.03.0072.01

$$\operatorname{sech}\left(\frac{8\pi i}{9}\right) = \frac{4\sqrt[3]{2}}{\left(-1+i\sqrt{3}\right)^{4/3}+\left(-1-i\sqrt{3}\right)^{4/3}}$$

01.24.03.0073.01

$$\operatorname{sech}\left(\frac{8\pi i}{9}\right) = \left(z;\, z^3-6z^2+8\right)_1^{-1}$$

01.24.03.0074.01

$$\operatorname{sech}\left(\frac{8\pi i}{9}\right) = -\frac{2(-1)^{8/9}}{-1+(-1)^{7/9}}$$

01.24.03.0075.01

$$\operatorname{sech}\left(\frac{9\pi i}{10}\right) == -\sqrt{2-\frac{2}{\sqrt{5}}}$$

01.24.03.0076.01

$$\operatorname{sech}\left(\frac{9\pi i}{10}\right) == \left(z;\, 5z^4 - 20z^2 + 16\right)_2^{-1}$$

01.24.03.0077.01

$$\operatorname{sech}\left(\frac{11\pi i}{12}\right) == \sqrt{2} - \sqrt{6}$$

01.24.03.0078.01

$$\operatorname{sech}\left(\frac{11\pi i}{12}\right) == \left(z;\, z^4 - 16z^2 + 16\right)_2^{-1}$$

01.24.03.0079.01

$$\operatorname{sech}(\pi i) == -1$$

01.24.03.0080.01

$$\operatorname{sech}\left(\frac{13\pi i}{12}\right) == \sqrt{2} - \sqrt{6}$$

01.24.03.0081.01

$$\operatorname{sech}\left(\frac{13\pi i}{12}\right) == \left(z;\, z^4 - 16z^2 + 16\right)_2^{-1}$$

01.24.03.0082.01

$$\operatorname{sech}\left(\frac{11\pi i}{10}\right) == -\sqrt{2-\frac{2}{\sqrt{5}}}$$

01.24.03.0083.01

$$\operatorname{sech}\left(\frac{11\pi i}{10}\right) == \left(z;\, 5z^4 - 20z^2 + 16\right)_2^{-1}$$

01.24.03.0084.01

$$\operatorname{sech}\left(\frac{10\pi i}{9}\right) == \frac{4\sqrt[3]{2}}{\left(-1+i\sqrt{3}\right)^{4/3}+\left(-1-i\sqrt{3}\right)^{4/3}}$$

01.24.03.0085.01

$$\operatorname{sech}\left(\frac{10\pi i}{9}\right) == \left(z;\, z^3 - 6z^2 + 8\right)_1^{-1}$$

01.24.03.0086.01

$$\operatorname{sech}\left(\frac{10\pi i}{9}\right) == -\frac{2(-1)^{8/9}}{-1+(-1)^{7/9}}$$

01.24.03.0087.01

$$\operatorname{sech}\left(\frac{9\pi i}{8}\right) == -\frac{2}{\sqrt{2+\sqrt{2}}}$$

01.24.03.0088.01

$$\operatorname{sech}\left(\frac{9\pi i}{8}\right) == \left(z;\, z^4 - 8z^2 + 8\right)_2^{-1}$$

01.24.03.0089.01

$$\operatorname{sech}\left(\frac{9\pi i}{8}\right) == -\frac{2(-1)^{7/8}}{-1 + (-1)^{3/4}}$$

01.24.03.0090.01

$$\operatorname{sech}\left(\frac{8\pi i}{7}\right) ==$$

$$-\left(12\, 2^{2/3} \sqrt[3]{7 - 21 i \sqrt{3}}\right) \Big/ \left(2\, 2^{2/3} \sqrt[3]{7 - 21 i \sqrt{3}} + \sqrt[3]{2} \left(7 - 21 i \sqrt{3}\right)^{2/3} + 2\sqrt{3} \left(\frac{7}{2} - \frac{21 i \sqrt{3}}{2}\right)^{2/3} i - 14 i \sqrt{3} + 14\right)$$

01.24.03.0091.01

$$\operatorname{sech}\left(\frac{8\pi i}{7}\right) == \left(z;\, z^3 + 4z^2 - 4z - 8\right)_2^{-1}$$

01.24.03.0092.01

$$\operatorname{sech}\left(\frac{8\pi i}{7}\right) == -\frac{2(-1)^{6/7}}{-1 + (-1)^{5/7}}$$

01.24.03.0093.01

$$\operatorname{sech}\left(\frac{7\pi i}{6}\right) == -\frac{2}{\sqrt{3}}$$

01.24.03.0094.01

$$\operatorname{sech}\left(\frac{6\pi i}{5}\right) == 1 - \sqrt{5}$$

01.24.03.0095.01

$$\operatorname{sech}\left(\frac{11\pi i}{9}\right) == -\frac{2\sqrt[3]{2}}{\sqrt[3]{-1 + i\sqrt{3}} + \sqrt[3]{-1 - i\sqrt{3}}}$$

01.24.03.0096.01

$$\operatorname{sech}\left(\frac{11\pi i}{9}\right) == \left(z;\, z^3 + 6z^2 - 8\right)_2^{-1}$$

01.24.03.0097.01

$$\operatorname{sech}\left(\frac{11\pi i}{9}\right) == -\frac{2(-1)^{7/9}}{-1 + (-1)^{5/9}}$$

01.24.03.0098.01

$$\operatorname{sech}\left(\frac{5\pi i}{4}\right) == -\sqrt{2}$$

01.24.03.0099.01

$$\operatorname{sech}\left(\frac{9\pi i}{7}\right) = \left(12\, 2^{2/3} \sqrt[3]{7-21 i \sqrt{3}}\right) \Big/ \left(2\sqrt{7}\, i \sqrt[3]{7+\frac{i\sqrt{7}}{2}+\frac{3\sqrt{21}}{2}} - 2\sqrt{21} \sqrt[3]{7+\frac{i\sqrt{7}}{2}+\frac{3\sqrt{21}}{2}} + 2\, 2^{2/3} \sqrt[3]{7-21 i \sqrt{3}} - i\sqrt{3}\left(14-i\sqrt{7}-3\sqrt{21}\right)^{2/3} \sqrt[3]{14+i\sqrt{7}+3\sqrt{21}} - 2\sqrt[3]{14-i\sqrt{7}-3\sqrt{21}} \left(14+i\sqrt{7}+3\sqrt{21}\right)^{2/3} + \sqrt[3]{14+i\sqrt{7}+3\sqrt{21}} \left(14-i\sqrt{7}-3\sqrt{21}\right)^{2/3} + 4\sqrt{7} \sqrt[3]{7-\frac{i\sqrt{7}}{2}-\frac{3\sqrt{21}}{2}}\, i\right)$$

01.24.03.0100.01

$$\operatorname{sech}\left(\frac{9\pi i}{7}\right) = \left(z;\, z^3-4z^2-4z+8\right)_1^{-1}$$

01.24.03.0101.01

$$\operatorname{sech}\left(\frac{9\pi i}{7}\right) = \frac{2(-1)^{5/7}}{1-(-1)^{3/7}}$$

01.24.03.0102.01

$$\operatorname{sech}\left(\frac{13\pi i}{10}\right) = -\sqrt{2+\frac{2}{\sqrt{5}}}$$

01.24.03.0103.01

$$\operatorname{sech}\left(\frac{13\pi i}{10}\right) = \left(z;\, 5z^4-20z^2+16\right)_1^{-1}$$

01.24.03.0104.01

$$\operatorname{sech}\left(\frac{4\pi i}{3}\right) = -2$$

01.24.03.0105.01

$$\operatorname{sech}\left(\frac{11\pi i}{8}\right) = -\sqrt{2\left(2+\sqrt{2}\right)}$$

01.24.03.0106.01

$$\operatorname{sech}\left(\frac{11\pi i}{8}\right) = \left(z;\, z^4-8z^2+8\right)_1^{-1}$$

01.24.03.0107.01

$$\operatorname{sech}\left(\frac{11\pi i}{8}\right) = -\frac{2(-1)^{5/8}}{-1+\sqrt[4]{-1}}$$

01.24.03.0108.01

$$\operatorname{sech}\left(\frac{7\pi i}{5}\right) = -1-\sqrt{5}$$

01.24.03.0109.01

$$\operatorname{sech}\left(\frac{17\pi i}{12}\right) = -2\sqrt{2+\sqrt{3}}$$

01.24.03.0110.01

$$\operatorname{sech}\left(\frac{17\pi i}{12}\right) == \left(z;\, z^4 - 16z^2 + 16\right)_1^{-1}$$

01.24.03.0111.01

$$\operatorname{sech}\left(\frac{10\pi i}{7}\right) == -\left(6\, 2^{2/3} \sqrt[3]{7 - 21 i \sqrt{3}}\right) \Big/ \left(2^{2/3} \sqrt[3]{7 - 21 i \sqrt{3}} - i\sqrt{3}\left(\frac{7}{2} - \frac{21 i \sqrt{3}}{2}\right)^{2/3} + \left(\frac{7}{2}\left(1 - 3 i \sqrt{3}\right)\right)^{2/3} + 7\sqrt{3}\, i + 7\right)$$

01.24.03.0112.01

$$\operatorname{sech}\left(\frac{10\pi i}{7}\right) == \left(z;\, z^3 + 4z^2 - 4z - 8\right)_1^{-1}$$

01.24.03.0113.01

$$\operatorname{sech}\left(\frac{10\pi i}{7}\right) == -\frac{2(-1)^{4/7}}{-1 + \sqrt[7]{-1}}$$

01.24.03.0114.01

$$\operatorname{sech}\left(\frac{13\pi i}{9}\right) == -\frac{4 i \sqrt[3]{2}}{\sqrt[3]{-1 + i\sqrt{3}}\left(-i + \sqrt{3}\right) - \sqrt[3]{-1 - i\sqrt{3}}\left(i + \sqrt{3}\right)}$$

01.24.03.0115.01

$$\operatorname{sech}\left(\frac{13\pi i}{9}\right) == \left(z;\, z^3 + 6z^2 - 8\right)_1^{-1}$$

01.24.03.0116.01

$$\operatorname{sech}\left(\frac{13\pi i}{9}\right) == -\frac{2(-1)^{5/9}}{-1 + \sqrt[9]{-1}}$$

01.24.03.0117.01

$$\operatorname{sech}\left(\frac{3\pi i}{2}\right) == \tilde{\infty}$$

01.24.03.0118.01

$$\operatorname{sech}\left(\frac{14\pi i}{9}\right) == \frac{4 i \sqrt[3]{2}}{\sqrt[3]{-1 + i\sqrt{3}}\left(-i + \sqrt{3}\right) - \sqrt[3]{-1 - i\sqrt{3}}\left(i + \sqrt{3}\right)}$$

01.24.03.0119.01

$$\operatorname{sech}\left(\frac{14\pi i}{9}\right) == \left(z;\, z^3 - 6z^2 + 8\right)_3^{-1}$$

01.24.03.0120.01

$$\operatorname{sech}\left(\frac{14\pi i}{9}\right) == \frac{2(-1)^{4/9}}{1 + (-1)^{8/9}}$$

01.24.03.0121.01

$$\operatorname{sech}\left(\frac{11\pi i}{7}\right) = \left(12\, 2^{2/3} \sqrt[3]{7 - 21 i \sqrt{3}}\right) \Big/ \left(-4 i \sqrt{7} \sqrt[3]{7 + \frac{i\sqrt{7}}{2} + \frac{3\sqrt{21}}{2}} - 2\sqrt{7}\left(i + \sqrt{3}\right) \sqrt[3]{7 - \frac{i\sqrt{7}}{2} - \frac{3\sqrt{21}}{2}} + 2\, 2^{2/3} \sqrt[3]{7 - 21 i \sqrt{3}} - 2\left(14 - i\sqrt{7} - 3\sqrt{21}\right)^{2/3} \sqrt[3]{14 + i\sqrt{7} + 3\sqrt{21}} + \left(14 + i\sqrt{7} + 3\sqrt{21}\right)^{2/3} \sqrt[3]{14 - i\sqrt{7} - 3\sqrt{21}} + \sqrt{3}\left(14 + i\sqrt{7} + 3\sqrt{21}\right)^{2/3} \sqrt[3]{14 - i\sqrt{7} - 3\sqrt{21}}\, i\right)$$

01.24.03.0122.01

$$\operatorname{sech}\left(\frac{11\pi i}{7}\right) = \left(z; z^3 - 4z^2 - 4z + 8\right)_3^{-1}$$

01.24.03.0123.01

$$\operatorname{sech}\left(\frac{11\pi i}{7}\right) = \frac{2(-1)^{3/7}}{1 + (-1)^{6/7}}$$

01.24.03.0124.01

$$\operatorname{sech}\left(\frac{19\pi i}{12}\right) = \sqrt{6} + \sqrt{2}$$

01.24.03.0125.01

$$\operatorname{sech}\left(\frac{19\pi i}{12}\right) = \left(z; z^4 - 16z^2 + 16\right)_4^{-1}$$

01.24.03.0126.01

$$\operatorname{sech}\left(\frac{8\pi i}{5}\right) = 1 + \sqrt{5}$$

01.24.03.0127.01

$$\operatorname{sech}\left(\frac{13\pi i}{8}\right) = \sqrt{2\left(2 + \sqrt{2}\right)}$$

01.24.03.0128.01

$$\operatorname{sech}\left(\frac{13\pi i}{8}\right) = \left(z; z^4 - 8z^2 + 8\right)_4^{-1}$$

01.24.03.0129.01

$$\operatorname{sech}\left(\frac{13\pi i}{8}\right) = \frac{2(-1)^{3/8}}{1 + (-1)^{3/4}}$$

01.24.03.0130.01

$$\operatorname{sech}\left(\frac{5\pi i}{3}\right) = 2$$

01.24.03.0131.01

$$\operatorname{sech}\left(\frac{17\pi i}{10}\right) = \sqrt{2 + \frac{2}{\sqrt{5}}}$$

01.24.03.0132.01

$$\operatorname{sech}\left(\frac{17\pi i}{10}\right) = \left(z;\, 5z^4 - 20z^2 + 16\right)_4^{-1}$$

01.24.03.0133.01

$$\operatorname{sech}\left(\frac{12\pi i}{7}\right) = \frac{3\, 2^{2/3} \sqrt[3]{7 - 21 i \sqrt{3}}}{-\sqrt[3]{\frac{7}{2}\left(1 - 3 i \sqrt{3}\right)} + \left(\frac{7}{2}\left(1 - 3 i \sqrt{3}\right)\right)^{2/3} + 7}$$

01.24.03.0134.01

$$\operatorname{sech}\left(\frac{12\pi i}{7}\right) = \left(z;\, z^3 + 4z^2 - 4z - 8\right)_3^{-1}$$

01.24.03.0135.01

$$\operatorname{sech}\left(\frac{12\pi i}{7}\right) = \frac{2(-1)^{2/7}}{1 + (-1)^{4/7}}$$

01.24.03.0136.01

$$\operatorname{sech}\left(\frac{7\pi i}{4}\right) = \sqrt{2}$$

01.24.03.0137.01

$$\operatorname{sech}\left(\frac{16\pi i}{9}\right) = \frac{2\sqrt[3]{2}}{\sqrt[3]{-1 + i\sqrt{3}} + \sqrt[3]{-1 - i\sqrt{3}}}$$

01.24.03.0138.01

$$\operatorname{sech}\left(\frac{16\pi i}{9}\right) = \left(z;\, z^3 - 6z^2 + 8\right)_2^{-1}$$

01.24.03.0139.01

$$\operatorname{sech}\left(\frac{16\pi i}{9}\right) = \frac{2(-1)^{2/9}}{1 + (-1)^{4/9}}$$

01.24.03.0140.01

$$\operatorname{sech}\left(\frac{9\pi i}{5}\right) = \sqrt{5} - 1$$

01.24.03.0141.01

$$\operatorname{sech}\left(\frac{11\pi i}{6}\right) = \frac{2}{\sqrt{3}}$$

01.24.03.0142.01

$$\operatorname{sech}\left(\frac{13\pi i}{7}\right) = 24 \Bigg/ \left(2\left(1 - i\sqrt{3}\right)\sqrt[3]{7 + \frac{i\sqrt{7}}{2} + \frac{3\sqrt{21}}{2}} + \frac{2\sqrt{7}\left(-i + \sqrt{3}\right)}{\sqrt[3]{7 + \frac{i\sqrt{7}}{2} + \frac{3\sqrt{21}}{2}}} + \frac{2\sqrt{7}\left(i + \sqrt{3}\right)}{\sqrt[3]{7 - \frac{i\sqrt{7}}{2} - \frac{3\sqrt{21}}{2}}} + \sqrt[3]{7 - \frac{i\sqrt{7}}{2} - \frac{3\sqrt{21}}{2}}\left(2 + 2i\sqrt{3}\right) + 4\right)$$

01.24.03.0143.01

$$\operatorname{sech}\left(\frac{13\pi i}{7}\right) = \left(z;\, z^3 - 4z^2 - 4z + 8\right)_2^{-1}$$

01.24.03.0144.01

$$\operatorname{sech}\left(\frac{13\pi i}{7}\right) = \frac{2\sqrt[7]{-1}}{1 + (-1)^{2/7}}$$

01.24.03.0145.01

$$\operatorname{sech}\left(\frac{15\pi i}{8}\right) = \frac{2}{\sqrt{2+\sqrt{2}}}$$

01.24.03.0146.01

$$\operatorname{sech}\left(\frac{15\pi i}{8}\right) = \left(z;\, z^4 - 8z^2 + 8\right)_3^{-1}$$

01.24.03.0147.01

$$\operatorname{sech}\left(\frac{15\pi i}{8}\right) = \frac{2\sqrt[8]{-1}}{1 + \sqrt[4]{-1}}$$

01.24.03.0148.01

$$\operatorname{sech}\left(\frac{17\pi i}{9}\right) = -\frac{4\sqrt[3]{2}}{\left(-1 + i\sqrt{3}\right)^{4/3} + \left(-1 - i\sqrt{3}\right)^{4/3}}$$

01.24.03.0149.01

$$\operatorname{sech}\left(\frac{17\pi i}{9}\right) = \left(z;\, z^3 + 6z^2 - 8\right)_3^{-1}$$

01.24.03.0150.01

$$\operatorname{sech}\left(\frac{17\pi i}{9}\right) = \frac{2\sqrt[9]{-1}}{1 + (-1)^{2/9}}$$

01.24.03.0151.01

$$\operatorname{sech}\left(\frac{19\pi i}{10}\right) = \sqrt{2 - \frac{2}{\sqrt{5}}}$$

01.24.03.0152.01

$$\operatorname{sech}\left(\frac{19\pi i}{10}\right) = \left(z;\, 5z^4 - 20z^2 + 16\right)_3^{-1}$$

01.24.03.0153.01

$$\operatorname{sech}\left(\frac{23\pi i}{12}\right) = \sqrt{6} - \sqrt{2}$$

01.24.03.0154.01

$$\operatorname{sech}\left(\frac{23\pi i}{12}\right) = \left(z;\, z^4 - 16z^2 + 16\right)_3^{-1}$$

01.24.03.0155.01

$$\operatorname{sech}(2\pi i) = 1$$

01.24.03.0156.01

$$\operatorname{sech}\left(\frac{\pi i}{17}\right) = 4 \Bigg/ \left(\sqrt{\left(\frac{1}{2}\left(\sqrt{\left(2\left(-\sqrt{2\left(17-\sqrt{17}\right)}+6\sqrt{17}+\sqrt{34\left(17-\sqrt{17}\right)}-8\sqrt{2\left(17+\sqrt{17}\right)}+34\right)\right)}+\sqrt{17}+\sqrt{2\left(17-\sqrt{17}\right)}+15\right)\right)}\right)$$

01.24.03.0157.01

$$\operatorname{sech}\left(\frac{\pi i}{30}\right) = \frac{8}{\sqrt{3}+\sqrt{15}+\sqrt{10-2\sqrt{5}}}$$

$\operatorname{sech}\left(\frac{n i \pi}{m}\right)$ can be expressed using only square roots if $n \in \mathbb{Z}$ and $m$ is a product of a power of 2 and distinct Fermat primes $\{3, 5, 17, 257, \ldots\}$.

### Values at infinities

01.24.03.0158.01

$$\operatorname{sech}(\infty) = 0$$

01.24.03.0159.01

$$\operatorname{sech}(-\infty) = 0$$

01.24.03.0160.01

$$\operatorname{sech}(\tilde{\infty}) = ¿$$

## General characteristics

### Domain and analyticity

$\operatorname{sech}(z)$ is an analytical function of $z$ which is defined over the whole complex $z$-plane.

01.24.04.0001.01

$$z \longrightarrow \operatorname{sech}(z) :: \mathbb{C} \longrightarrow \mathbb{C}$$

### Symmetries and periodicities

#### Parity

$\operatorname{sech}(z)$ is an even function.

01.24.04.0002.01

$$\operatorname{sech}(-z) = \operatorname{sech}(z)$$

#### Mirror symmetry

01.24.04.0003.01

$$\operatorname{sech}(\bar{z}) = \overline{\operatorname{sech}(z)}$$

#### Periodicity

$\operatorname{sech}(z)$ is a periodic function with period $2 \pi i$.

01.24.04.0010.01

$$\operatorname{sech}(z + 2\pi i) = \operatorname{sech}(z)$$

01.24.04.0004.01

$$\operatorname{sech}(z + 2\pi i m) = \operatorname{sech}(z) /; m \in \mathbb{Z}$$

01.24.04.0005.01

$$\operatorname{sech}(z + \pi i m) = (-1)^m \operatorname{sech}(z) /; m \in \mathbb{Z}$$

### Poles and essential singularities

The function $\operatorname{sech}(z)$ has an infinite set of singular points:

a) $z = \pi i/2 + \pi i k /; k \in \mathbb{Z}$ are the simple poles with residues $(-1)^{k-1} i$;

b) $z = \tilde{\infty}$ is an essential singular point.

01.24.04.0006.01

$$\mathcal{S}ing_z(\operatorname{sech}(z)) = \left\{\left\{\left\{\frac{\pi i}{2} + \pi i k, 1\right\} /; k \in \mathbb{Z}\right\}, \{\tilde{\infty}, \infty\}\right\}$$

01.24.04.0007.01

$$\operatorname{res}_z(\operatorname{sech}(z))\left(\frac{\pi i}{2} + \pi i k\right) = (-1)^{k-1} i /; k \in \mathbb{Z}$$

### Branch points

The function $\operatorname{sech}(z)$ does not have branch points.

01.24.04.0008.01

$$\mathcal{BP}_z(\operatorname{sech}(z)) = \{\}$$

### Branch cuts

The function $\operatorname{sech}(z)$ does not have branch cuts.

01.24.04.0009.01

$$\mathcal{BC}_z(\operatorname{sech}(z)) = \{\}$$

## Series representations

### Generalized power series

**Expansions at $z = z_0$**

### For the function itself

01.24.06.0019.01

$$\operatorname{sech}(z) \propto \operatorname{sech}(z_0) - \operatorname{sech}(z_0)\tanh(z_0)(z - z_0) - 3\operatorname{sech}(z_0)\left(\frac{1}{2} - \frac{1}{3}\cosh(2 z_0)\operatorname{sech}^2(z_0)\right)(z - z_0)^2 + \ldots /; (z \to z_0)$$

01.24.06.0020.01

$$\operatorname{sech}(z) \propto \operatorname{sech}(z_0) - \operatorname{sech}(z_0)\tanh(z_0)(z - z_0) - 3\operatorname{sech}(z_0)\left(\frac{1}{2} - \frac{1}{3}\cosh(2 z_0)\operatorname{sech}^2(z_0)\right)(z - z_0)^2 + O\left((z - z_0)^3\right)$$

01.24.06.0021.01

$$\operatorname{sech}(z) == \operatorname{sech}(z_0) \sum_{k=0}^{\infty} \left( \delta_k + i^k (k+1) \sum_{m=0}^{k} \sum_{j=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \frac{(-1)^m 2^{1-m} (m-2j)^k \operatorname{sech}^m(z_0)}{(m+1)\, j!\, (m-j)!\, (k-m)!} \cosh\left( \frac{i k \pi}{2} - (m-2j) z_0 \right) \right) (z-z_0)^k$$

01.24.06.0022.01

$$\operatorname{sech}(z) \propto \operatorname{sech}(z_0) (1 + O(z - z_0))$$

### Expansions at $z == 0$

## For the function itself

01.24.06.0001.02

$$\operatorname{sech}(z) \propto 1 - \frac{z^2}{2} + \frac{5 z^4}{24} - \frac{61 z^6}{720} + \ldots \;/;\; (z \to 0)$$

01.24.06.0023.01

$$\operatorname{sech}(z) \propto 1 - \frac{z^2}{2} + \frac{5 z^4}{24} - \frac{61 z^6}{720} + O\left(z^8\right)$$

01.24.06.0002.01

$$\operatorname{sech}(z) == \sum_{k=0}^{\infty} \frac{E_{2k} z^{2k}}{(2k)!} \;/;\; |z| < \frac{\pi}{2}$$

01.24.06.0003.02

$$\operatorname{sech}(z) \propto 1 + O\left(z^2\right)$$

### Expansions at $z == \frac{\pi i}{2}$

## For the function itself

01.24.06.0004.02

$$\operatorname{sech}(z) \propto -\frac{i}{z - \frac{\pi i}{2}} + \frac{i}{6}\left(z - \frac{i\pi}{2}\right) - \frac{7i}{360}\left(z - \frac{i\pi}{2}\right)^3 + \ldots \;/;\; \left(z \to \frac{\pi i}{2}\right)$$

01.24.06.0024.01

$$\operatorname{sech}(z) \propto -\frac{i}{z - \frac{\pi i}{2}} + \frac{i}{6}\left(z - \frac{i\pi}{2}\right) - \frac{7i}{360}\left(z - \frac{i\pi}{2}\right)^3 + O\left(\left(z - \frac{i\pi}{2}\right)^5\right)$$

01.24.06.0005.01

$$\operatorname{sech}(z) == 2i \sum_{k=0}^{\infty} \frac{\left(2^{2k-1} - 1\right) B_{2k}}{(2k)!} \left(z - \frac{\pi i}{2}\right)^{2k-1} \;/;\; \left|z - \frac{\pi i}{2}\right| < \pi$$

01.24.06.0006.02

$$\operatorname{sech}(z) \propto -\frac{i}{z - \frac{\pi i}{2}} + \frac{i}{6}\left(z - \frac{\pi i}{2}\right) + O\left(\left(z - \frac{\pi i}{2}\right)^3\right)$$

### *q*-series

01.24.06.0007.01

$$\operatorname{sech}(z) = -2 \sum_{k=1}^{\infty} (-1)^k q^{2k-1} /; q = e^z$$

## Dirichlet series

01.24.06.0008.01

$$\operatorname{sech}(z) = 2 e^{-z} \sum_{k=0}^{\infty} (-1)^k e^{-2zk} /; \operatorname{Re}(z) > 0$$

01.24.06.0009.01

$$\operatorname{sech}(z) = 2 e^{z} \sum_{k=0}^{\infty} (-1)^k e^{2zk} /; \operatorname{Re}(z) < 0$$

## Asymptotic series expansions

01.24.06.0010.01

$$\operatorname{sech}(z) \propto 2 e^{-z} {}_1F_0\left(1; ; -e^{-2z}\right) /; \operatorname{Re}(z) > 0 \land (|z| \to \infty)$$

01.24.06.0011.01

$$\operatorname{sech}(z) \propto 2 e^{-z} \left(1 + O\left(e^{-2z}\right)\right) /; \operatorname{Re}(z) > 0 \land (|z| \to \infty)$$

01.24.06.0012.01

$$\operatorname{sech}(z) \propto 2 e^{z} {}_1F_0\left(1; ; -e^{2z}\right) /; \operatorname{Re}(z) < 0 \land (|z| \to \infty)$$

01.24.06.0013.01

$$\operatorname{sech}(z) \propto 2 e^{z} \left(1 + O\left(e^{2z}\right)\right) /; \operatorname{Re}(z) < 0 \land (|z| \to \infty)$$

01.24.06.0014.01

$$\operatorname{sech}(z) \propto \operatorname{sech}(z) /; \operatorname{Re}(z) = 0 \land (|z| \to \infty)$$

01.24.06.0015.01

$$\operatorname{sech}(z) \propto 2 e^{-z} /; \left(z \to e^{i\phi} \infty\right) \bigwedge -\frac{\pi}{2} < \phi < \frac{\pi}{2}$$

01.24.06.0016.01

$$\operatorname{sech}(z) \propto 2 e^{z} /; \left(z \to e^{i\phi} \infty\right) \bigwedge -\pi < \phi < -\frac{\pi}{2} \bigvee \frac{\pi}{2} < \phi \leq \pi$$

01.24.06.0025.01

$$\operatorname{sech}(z) \propto \begin{cases} 2 e^{z} & -\pi < \arg(z) < -\frac{\pi}{2} \bigvee \frac{\pi}{2} < \arg(z) \leq \pi \\ 2 e^{-z} & -\frac{\pi}{2} < \arg(z) < \frac{\pi}{2} \\ \operatorname{sech}(z) & \text{True} \end{cases} /; (|z| \to \infty)$$

## Other series representations

01.24.06.0017.01

$$\operatorname{sech}(z) = \pi \sum_{k=0}^{\infty} \frac{(-1)^k (2k+1)}{\pi^2 \left(k + \frac{1}{2}\right)^2 + z^2} /; \frac{i z}{\pi} - \frac{1}{2} \notin \mathbb{Z}$$

01.24.06.0018.01

$$\operatorname{sech}^2(z) = -\sum_{k=-\infty}^{\infty} \frac{1}{\left(z + \pi i \left(k + \frac{1}{2}\right)\right)^2} /; \frac{i z}{\pi} - \frac{1}{2} \notin \mathbb{Z}$$

# Integral representations

## On the real axis

### Of the direct function

01.24.07.0001.01

$$\operatorname{sech}(z) = \frac{2}{\pi} \int_0^{\infty} \frac{1}{t^2 + 1} t^{\frac{2 i z}{\pi}} \, dt /; |\operatorname{Im}(z)| < \frac{\pi}{2}$$

# Product representations

01.24.08.0001.01

$$\operatorname{sech}(z) = \prod_{k=1}^{\infty} \frac{\pi^2 (2k - 1)^2}{\pi^2 (2k - 1)^2 + 4 z^2}$$

# Limit representations

01.24.09.0001.01

$$\operatorname{sech}(z) = \lim_{n \to \infty} \left( \sum_{k=-n}^{n} \frac{(-1)^k}{\pi \left(k + \frac{1}{2}\right) - i z} \right) /; \frac{i z}{\pi} - \frac{1}{2} \notin \mathbb{Z}$$

# Differential equations

## Ordinary nonlinear differential equations

01.24.13.0001.01

$$w'(z)^2 + w(z)^4 - w(z)^2 = 0 /; w(z) = \operatorname{sech}(z)$$

01.24.13.0002.01

$$w''(z) w(z) - 2 w'(z)^2 - w(z)^2 = 0 /; w(z) = c_2 e^{-c_1} \operatorname{sech}(z + c_1)$$

# Transformations

## Transformations and argument simplifications

### Argument involving basic arithmetic operations

01.24.16.0001.01

$$\operatorname{sech}(-z) = \operatorname{sech}(z)$$

01.24.16.0002.01

$$\operatorname{sech}(a (b z^c)^m) = \operatorname{sech}(a b^m z^{m c}) /; 2 m \in \mathbb{Z}$$

01.24.16.0003.01

$$\operatorname{sech}\left(\sqrt{z^2}\right) = \operatorname{sech}(z)$$

**Argument involving inverse trigonometric and hyperbolic functions**

## Involving $\sin^{-1}$

01.24.16.0055.01

$$\operatorname{sech}(\sin^{-1}(z)) = \frac{2\left(i z + \sqrt{1-z^2}\right)^{i}}{\left(i z + \sqrt{1-z^2}\right)^{2i} + 1}$$

01.24.16.0004.01

$$\operatorname{sech}(i \sin^{-1}(z)) = \frac{1}{\sqrt{1-z^2}}$$

01.24.16.0016.01

$$\operatorname{sech}\left(\frac{i}{2} \sin^{-1}(z)\right) = \frac{\sqrt{2}}{\sqrt{1+\sqrt{1-z^2}}}$$

01.24.16.0056.01

$$\operatorname{sech}(a \sin^{-1}(z)) = \frac{2\left(i z + \sqrt{1-z^2}\right)^{i a}}{\left(i z + \sqrt{1-z^2}\right)^{2 i a} + 1}$$

## Involving $\cos^{-1}$

01.24.16.0057.01

$$\operatorname{sech}(\cos^{-1}(z)) = \frac{2 e^{\pi/2}\left(i z + \sqrt{1-z^2}\right)^{i}}{e^{\pi}\left(i z + \sqrt{1-z^2}\right)^{2i} + 1}$$

01.24.16.0005.01

$$\operatorname{sech}(i \cos^{-1}(z)) = \frac{1}{z}$$

01.24.16.0017.01

$$\operatorname{sech}\left(\frac{i}{2} \cos^{-1}(z)\right) = \frac{\sqrt{2}}{\sqrt{1+z}}$$

01.24.16.0058.01

$$\operatorname{sech}(a \cos^{-1}(z)) = \frac{2 e^{\frac{a\pi}{2}}\left(i z + \sqrt{1-z^2}\right)^{a i}}{e^{a\pi}\left(i z + \sqrt{1-z^2}\right)^{2 a i} + 1}$$

## Involving $\tan^{-1}$

01.24.16.0059.01

$$\operatorname{sech}\left(\tan^{-1}(z)\right) = \frac{2\left(z^2+1\right)^{i/2}}{(i\,z+1)^{i}+(1-i\,z)^{i}}$$

01.24.16.0060.01

$$\operatorname{sech}\left(\tan^{-1}(x,\,y)\right) = \frac{2\left(\frac{x+i\,y}{\sqrt{x^2+y^2}}\right)^{i}}{\left(\frac{x+i\,y}{\sqrt{x^2+y^2}}\right)^{2\,i}+1}$$

01.24.16.0006.01

$$\operatorname{sech}\left(i\,\tan^{-1}(z)\right) == \sqrt{1+z^2}$$

01.24.16.0061.01

$$\operatorname{sech}\left(i\,\tan^{-1}(x,\,y)\right) = \frac{\sqrt{x^2+y^2}}{x}$$

01.24.16.0018.01

$$\operatorname{sech}\left(\frac{i}{2}\,\tan^{-1}(z)\right) == \frac{\sqrt{2}}{\sqrt{1+\frac{1}{\sqrt{1+z^2}}}}$$

01.24.16.0062.01

$$\operatorname{sech}\left(\frac{1}{2}\,i\,\tan^{-1}(x,\,y)\right) = \frac{2}{\sqrt{\frac{x+i\,y}{\sqrt{x^2+y^2}}}+\frac{1}{\sqrt{\frac{x+i\,y}{\sqrt{x^2+y^2}}}}}$$

01.24.16.0063.01

$$\operatorname{sech}\left(a\,\tan^{-1}(z)\right) = \frac{2\left(z^2+1\right)^{\frac{i\,a}{2}}}{(i\,z+1)^{i\,a}+(1-i\,z)^{i\,a}}$$

01.24.16.0064.01

$$\operatorname{sech}\left(a\,\tan^{-1}(x,\,y)\right) = \frac{2\left(\frac{x+i\,y}{\sqrt{x^2+y^2}}\right)^{i\,a}}{\left(\frac{x+i\,y}{\sqrt{x^2+y^2}}\right)^{2\,i\,a}+1}$$

## Involving $\cot^{-1}$

01.24.16.0065.01

$$\operatorname{sech}\left(\cot^{-1}(z)\right) = \frac{2\left(1+\frac{1}{z^2}\right)^{i/2}}{\left(\frac{-i+z}{z}\right)^{i}+\left(\frac{i+z}{z}\right)^{i}}$$

01.24.16.0007.01

$$\operatorname{sech}\left(i \cot^{-1}(z)\right) == \sqrt{1+\frac{1}{z^2}}$$

01.24.16.0019.01

$$\operatorname{sech}\left(\frac{i}{2} \cot^{-1}(z)\right) == \frac{\sqrt{2}}{\sqrt{1+\frac{1}{\sqrt{1+\frac{1}{z^2}}}}}$$

01.24.16.0066.01

$$\operatorname{sech}\left(a \cot^{-1}(z)\right) = \frac{2\left(1+\frac{1}{z^2}\right)^{\frac{i a}{2}}}{\left(\frac{-i+z}{z}\right)^{i a}+\left(\frac{i+z}{z}\right)^{i a}}$$

## Involving $\csc^{-1}$

01.24.16.0067.01

$$\operatorname{sech}\left(\csc^{-1}(z)\right) = \frac{2\left(\sqrt{1-\frac{1}{z^2}}+\frac{i}{z}\right)^{i}}{\left(\sqrt{1-\frac{1}{z^2}}+\frac{i}{z}\right)^{2 i}+1}$$

01.24.16.0008.01

$$\operatorname{sech}\left(i \csc^{-1}(z)\right) == \frac{\sqrt{z^2}}{\sqrt{z^2-1}}$$

01.24.16.0020.01

$$\operatorname{sech}\left(\frac{i}{2} \csc^{-1}(z)\right) == \frac{\sqrt{2}}{\sqrt{1+\frac{\sqrt{z^2}\sqrt{-1+z^2}}{z^2}}}$$

01.24.16.0068.01

$$\operatorname{sech}\left(a \csc^{-1}(z)\right) = \frac{2\left(\sqrt{1-\frac{1}{z^2}}+\frac{i}{z}\right)^{i a}}{\left(\sqrt{1-\frac{1}{z^2}}+\frac{i}{z}\right)^{2 i a}+1}$$

## Involving $\sec^{-1}$

01.24.16.0069.01

$$\operatorname{sech}(\sec^{-1}(z)) = \frac{2\, e^{\pi/2} \left(\sqrt{1-\frac{1}{z^2}} + \frac{i}{z}\right)^{i}}{e^{\pi} \left(\sqrt{1-\frac{1}{z^2}} + \frac{i}{z}\right)^{2 i} + 1}$$

01.24.16.0009.01

$$\operatorname{sech}(i \sec^{-1}(z)) = z$$

01.24.16.0021.01

$$\operatorname{sech}\left(\frac{i}{2} \sec^{-1}(z)\right) = \frac{\sqrt{-2 z}}{\sqrt{-z-1}}$$

01.24.16.0070.01

$$\operatorname{sech}(a \sec^{-1}(z)) = \frac{2\, e^{\frac{a \pi}{2}} \left(\sqrt{1-\frac{1}{z^2}} + \frac{i}{z}\right)^{a i}}{e^{a \pi} \left(\sqrt{1-\frac{1}{z^2}} + \frac{i}{z}\right)^{2 a i} + 1}$$

## Involving $\sinh^{-1}$

01.24.16.0010.01

$$\operatorname{sech}(\sinh^{-1}(z)) = \frac{1}{\sqrt{1+z^2}}$$

01.24.16.0022.01

$$\operatorname{sech}\left(\frac{1}{2} \sinh^{-1}(z)\right) = \frac{\sqrt{2}}{\sqrt{\sqrt{z^2+1} + 1}}$$

01.24.16.0071.01

$$\operatorname{sech}(i \sinh^{-1}(z)) = \frac{2 \left(z + \sqrt{z^2+1}\right)^{i}}{\left(z + \sqrt{z^2+1}\right)^{2 i} + 1}$$

01.24.16.0072.01

$$\operatorname{sech}(a \sinh^{-1}(z)) = \frac{2 \left(z + \sqrt{z^2+1}\right)^{a}}{\left(z + \sqrt{z^2+1}\right)^{2 a} + 1}$$

## Involving $\cosh^{-1}$

01.24.16.0011.01

$$\operatorname{sech}(\cosh^{-1}(z)) = \frac{1}{z}$$

01.24.16.0023.01

$$\operatorname{sech}\left(\frac{1}{2}\cosh^{-1}(z)\right) == \frac{\sqrt{2}}{\sqrt{z+1}}$$

01.24.16.0073.01

$$\operatorname{sech}(i\cosh^{-1}(z)) = \frac{2\left(z+\sqrt{z-1}\,\sqrt{z+1}\right)^{i}}{\left(z+\sqrt{z-1}\,\sqrt{z+1}\right)^{2i}+1}$$

01.24.16.0074.01

$$\operatorname{sech}(a\cosh^{-1}(z)) = \frac{2\left(z+\sqrt{z-1}\,\sqrt{z+1}\right)^{a}}{\left(z+\sqrt{z-1}\,\sqrt{z+1}\right)^{2a}+1}$$

## Involving $\tanh^{-1}$

01.24.16.0012.01

$$\operatorname{sech}(\tanh^{-1}(z)) == \sqrt{1-z^2}$$

01.24.16.0024.01

$$\operatorname{sech}\left(\frac{1}{2}\tanh^{-1}(z)\right) == \frac{\sqrt{2}}{\sqrt{1+\frac{1}{\sqrt{1-z^2}}}}$$

01.24.16.0075.01

$$\operatorname{sech}(i\tanh^{-1}(z)) = \frac{2\left(1-z^2\right)^{i/2}}{(1-z)^{i}+(z+1)^{i}}$$

01.24.16.0076.01

$$\operatorname{sech}(a\tanh^{-1}(z)) = \frac{2\left(1-z^2\right)^{a/2}}{(1-z)^{a}+(z+1)^{a}}$$

## Involving $\coth^{-1}$

01.24.16.0013.01

$$\operatorname{sech}(\coth^{-1}(z)) == \sqrt{1-\frac{1}{z^2}}$$

01.24.16.0025.01

$$\operatorname{sech}\left(\frac{1}{2}\coth^{-1}(z)\right) == \frac{\sqrt{2}}{\sqrt{1+\frac{1}{\sqrt{1-\frac{1}{z^2}}}}}$$

01.24.16.0077.01

$$\operatorname{sech}\left(i \coth^{-1}(z)\right) = \frac{2\left(1-\frac{1}{z^2}\right)^{i/2}}{\left(1+\frac{1}{z}\right)^{i} + \left(1-\frac{1}{z}\right)^{i}}$$

01.24.16.0078.01

$$\operatorname{sech}\left(a \coth^{-1}(z)\right) = \frac{2\left(1-\frac{1}{z^2}\right)^{a/2}}{\left(1+\frac{1}{z}\right)^{a} + \left(1-\frac{1}{z}\right)^{a}}$$

## Involving $\operatorname{csch}^{-1}$

01.24.16.0014.01

$$\operatorname{sech}\left(\operatorname{csch}^{-1}(z)\right) = \frac{\sqrt{-z^2}}{\sqrt{-1-z^2}}$$

01.24.16.0026.01

$$\operatorname{sech}\left(\frac{1}{2}\operatorname{csch}^{-1}(z)\right) = \frac{\sqrt{2}}{\sqrt{\sqrt{1+\frac{1}{z^2}}+1}}$$

01.24.16.0079.01

$$\operatorname{sech}\left(i \operatorname{csch}^{-1}(z)\right) = \frac{2\left(\sqrt{1+\frac{1}{z^2}}+\frac{1}{z}\right)^{i}}{\left(\sqrt{1+\frac{1}{z^2}}+\frac{1}{z}\right)^{2 i}+1}$$

01.24.16.0080.01

$$\operatorname{sech}\left(a \operatorname{csch}^{-1}(z)\right) = \frac{2\left(\sqrt{1+\frac{1}{z^2}}+\frac{1}{z}\right)^{a}}{\left(\sqrt{1+\frac{1}{z^2}}+\frac{1}{z}\right)^{2 a}+1}$$

## Involving $\operatorname{sech}^{-1}$

01.24.16.0015.01

$$\operatorname{sech}\left(\operatorname{sech}^{-1}(z)\right) = z$$

01.24.16.0027.01

$$\operatorname{sech}\left(\frac{1}{2}\operatorname{sech}^{-1}(z)\right) = \frac{\sqrt{-2 z}}{\sqrt{-z-1}}$$

01.24.16.0081.01

$$\operatorname{sech}\left(i\operatorname{sech}^{-1}(z)\right)=\frac{2\left(\sqrt{\frac{1}{z}-1}\sqrt{1+\frac{1}{z}}+\frac{1}{z}\right)^{i}}{\left(\sqrt{\frac{1}{z}-1}\sqrt{1+\frac{1}{z}}+\frac{1}{z}\right)^{2i}+1}$$

01.24.16.0082.01

$$\operatorname{sech}\left(a\operatorname{sech}^{-1}(z)\right)=\frac{2\left(\sqrt{\frac{1}{z}-1}\sqrt{1+\frac{1}{z}}+\frac{1}{z}\right)^{a}}{\left(\sqrt{\frac{1}{z}-1}\sqrt{1+\frac{1}{z}}+\frac{1}{z}\right)^{2a}+1}$$

## Addition formulas

01.24.16.0028.01

$$\operatorname{sech}(a+b)=\frac{1}{\cosh(a)\cosh(b)+\sinh(a)\sinh(b)}$$

01.24.16.0029.01

$$\operatorname{sech}(a-b)=\frac{1}{\cosh(b)\cosh(a)-\sinh(a)\sinh(b)}$$

01.24.16.0030.01

$$\operatorname{sech}(a+b\,i)=\frac{2\cos(b)\cosh(a)-2\,i\sin(b)\sinh(a)}{\cos(2\,b)+\cosh(2\,a)}$$

01.24.16.0031.01

$$\operatorname{sech}(a-i\,b)=\frac{2\cos(b)\cosh(a)+2\,i\sin(b)\sinh(a)}{\cos(2\,b)+\cosh(2\,a)}$$

## Half-angle formulas

01.24.16.0032.01

$$\operatorname{sech}\left(\frac{z}{2}\right)=(-1)^{\operatorname{Round}\left(\frac{\operatorname{Im}(z)}{2\pi}\right)}\frac{\sqrt{2}}{\sqrt{\cosh(z)+1}}$$

01.24.16.0033.01

$$\operatorname{sech}\left(\frac{z}{2}\right)=\frac{\sqrt{2}}{\sqrt{\cosh(z)+1}}\;/;\;|\operatorname{Im}(z)|<\pi$$

01.24.16.0034.01

$$\operatorname{sech}\left(\frac{z}{2}\right)=\frac{\sqrt{2}}{\sqrt{\cosh(z)+1}}(-1)^{\left\lfloor\frac{\pi-\operatorname{Im}(z)}{2\pi}\right\rfloor}\left(1-\left(1+(-1)^{\left\lfloor\frac{\pi-\operatorname{Im}(z)}{2\pi}\right\rfloor+\left\lfloor-\frac{\pi-\operatorname{Im}(z)}{2\pi}\right\rfloor}\right)\theta(-\operatorname{Re}(z))\right)$$

## Multiple arguments

### Argument involving numeric multiples of variable

01.24.16.0035.01

$$\operatorname{sech}(2z) = \frac{\operatorname{sech}^2(z)}{2 - \operatorname{sech}^2(z)}$$

01.24.16.0083.01

$$\operatorname{sech}(3z) = \frac{\operatorname{sech}^3(z)}{4 - 3\operatorname{sech}^2(z)}.$$

### Argument involving symbolic multiples of variable

01.24.16.0036.01

$$\operatorname{sech}(nz) = \frac{1}{T_n(\cosh(z))}$$

## Products, sums, and powers of the direct function

### Products of the direct function

01.24.16.0084.01

$$\operatorname{sech}(a)\operatorname{sech}(b) = \frac{2}{\cosh(a-b) + \cosh(a+b)}$$

### Products involving the direct function

01.24.16.0085.01

$$\operatorname{sech}(a)\operatorname{csch}(b) = \frac{2}{\sinh(a+b) - \sinh(a-b)}$$

### Sums of the direct function

01.24.16.0037.01

$$\operatorname{sech}(a) + \operatorname{sech}(b) = 2\cosh\left(\frac{a}{2} - \frac{b}{2}\right)\cosh\left(\frac{a}{2} + \frac{b}{2}\right)\operatorname{sech}(a)\operatorname{sech}(b)$$

01.24.16.0038.01

$$\operatorname{sech}(a) - \operatorname{sech}(b) = -2\sinh\left(\frac{a}{2} - \frac{b}{2}\right)\sinh\left(\frac{a}{2} + \frac{b}{2}\right)\operatorname{sech}(a)\operatorname{sech}(b)$$

### Sums involving the direct function

# Involving other hyperbolic functions

## Involving csch

01.24.16.0042.01

$$\operatorname{sech}(z) - i\operatorname{csch}(z) = -\sqrt{2}\, i\cosh\left(\frac{i\pi}{4} + z\right)\operatorname{csch}(z)\operatorname{sech}(z)$$

01.24.16.0043.01

$$\operatorname{sech}(z) + i\operatorname{csch}(z) = \sqrt{2}\, i\cosh\left(z - \frac{i\pi}{4}\right)\operatorname{csch}(z)\operatorname{sech}(z)$$

01.24.16.0044.01

$$\operatorname{sech}(a)+i\operatorname{csch}(b)=2\,i\cosh\left(\frac{a-b}{2}+\frac{i\pi}{4}\right)\cosh\left(\frac{a+b}{2}-\frac{i\pi}{4}\right)\operatorname{csch}(b)\operatorname{sech}(a)$$

01.24.16.0045.01

$$\operatorname{sech}(a)-i\operatorname{csch}(b)=-2\,i\cosh\left(\frac{a-b}{2}-\frac{i\pi}{4}\right)\cosh\left(\frac{a+b}{2}+\frac{i\pi}{4}\right)\operatorname{csch}(b)\operatorname{sech}(a)$$

01.24.16.0046.01

$$a\operatorname{sech}(z)+b\operatorname{csch}(z)=2\sqrt{1-\frac{b^2}{a^2}}\;a\operatorname{csch}(2z)\sinh\left(z+\tanh^{-1}\left(\frac{b}{a}\right)\right)$$

## Involving trigonometric functions

### Involving csc

01.24.16.0047.01

$$\csc(z)+\operatorname{sech}(z)=2\cos\left(\frac{\pi}{4}-\frac{i\,e^{-\frac{1}{4}(i\pi)}\,z}{\sqrt{2}}\right)\cos\left(\frac{e^{\frac{i\pi}{4}}\,i\,z}{\sqrt{2}}+\frac{\pi}{4}\right)\csc(z)\operatorname{sech}(z)$$

01.24.16.0048.01

$$\operatorname{sech}(z)-\csc(z)=-2\cos\left(\frac{e^{-\frac{1}{4}(i\pi)}\,i\,z}{\sqrt{2}}+\frac{\pi}{4}\right)\cos\left(\frac{\pi}{4}-\frac{i\,e^{\frac{i\pi}{4}}\,z}{\sqrt{2}}\right)\csc(z)\operatorname{sech}(z)$$

01.24.16.0049.01

$$\operatorname{sech}(a)+\csc(b)=2\cosh\left(\frac{a+i\,b}{2}-\frac{i\pi}{4}\right)\cosh\left(\frac{a-i\,b}{2}+\frac{i\pi}{4}\right)\csc(b)\operatorname{sech}(a)$$

01.24.16.0050.01

$$\operatorname{sech}(a)-\csc(b)=-2\cosh\left(\frac{a+i\,b}{2}+\frac{i\pi}{4}\right)\cosh\left(\frac{a-i\,b}{2}-\frac{i\pi}{4}\right)\csc(b)\operatorname{sech}(a)$$

### Involving sec

01.24.16.0051.01

$$\operatorname{sech}(z)+\sec(z)=2\cos\left(\frac{z\,e^{-\frac{1}{4}(i\pi)}}{\sqrt{2}}\right)\cos\left(\frac{z\,e^{\frac{i\pi}{4}}}{\sqrt{2}}\right)\sec(z)\operatorname{sech}(z)$$

01.24.16.0052.01

$$\operatorname{sech}(z)-\sec(z)=-2\sin\left(\frac{z\,e^{-\frac{1}{4}(i\pi)}}{\sqrt{2}}\right)\sin\left(\frac{z\,e^{\frac{i\pi}{4}}}{\sqrt{2}}\right)\sec(z)\operatorname{sech}(z)$$

01.24.16.0053.01

$$\operatorname{sech}(a)+\sec(b)=2\cosh\left(\frac{a-i\,b}{2}\right)\cosh\left(\frac{a+i\,b}{2}\right)\sec(b)\operatorname{sech}(a)$$

01.24.16.0054.01

$$\operatorname{sech}(a) - \sec(b) == -2 \sinh\left(\frac{a - i b}{2}\right) \sinh\left(\frac{a + i b}{2}\right) \sec(b)$$

### Powers of the direct function

01.24.16.0039.01

$$\operatorname{sech}^2(z) == \frac{2 \operatorname{sech}(2 z)}{\operatorname{sech}(2 z) + 1}$$

### Sums of powers involving the direct function

01.24.16.0040.01

$$\operatorname{sech}^2(a) - \operatorname{sech}^2(b) == -\operatorname{sech}^2(a) \operatorname{sech}^2(b) \sinh(a - b) \sinh(a + b)$$

01.24.16.0041.01

$$\operatorname{csch}^2(b) + \operatorname{sech}^2(a) == \cosh(a - b) \cosh(a + b) \operatorname{csch}^2(b) \operatorname{sech}^2(a)$$

# Identities

## Functional identities

01.24.17.0001.01

$$\operatorname{sech}(2 z) \left(2 - \operatorname{sech}^2(z)\right) == \operatorname{sech}^2(z)$$

01.24.17.0002.01

$$-\operatorname{sech}^2(z_1) \operatorname{sech}^2(z_2) + 2 \operatorname{sech}(z_1) \operatorname{sech}(z_1 + z_2) \operatorname{sech}(z_2) + \left(\operatorname{sech}^2(z_2) \operatorname{sech}^2(z_1) - \operatorname{sech}^2(z_1) - \operatorname{sech}^2(z_2)\right) \operatorname{sech}^2(z_1 + z_2) == 0$$

# Complex characteristics

## Real part

01.24.19.0001.01

$$\operatorname{Re}(\operatorname{sech}(x + i y)) == \frac{2 \cos(y) \cosh(x)}{\cos(2 y) + \cosh(2 x)}$$

## Imaginary part

01.24.19.0002.01

$$\operatorname{Im}(\operatorname{sech}(x + i y)) == -\frac{2 \sin(y) \sinh(x)}{\cos(2 y) + \cosh(2 x)}$$

## Absolute value

01.24.19.0003.01

$$|\operatorname{sech}(x + i y)| == \frac{\sqrt{2}}{\sqrt{\cos(2 y) + \cosh(2 x)}}$$

## Argument

01.24.19.0004.01

$$\arg(\operatorname{sech}(x+i\,y)) = \tan^{-1}\left(\frac{\cos(y)\cosh(x)}{\cos(2\,y)+\cosh(2\,x)}, -\frac{\sin(y)\sinh(x)}{\cos(2\,y)+\cosh(2\,x)}\right)$$

01.24.19.0005.01

$$\arg(\operatorname{sech}(x+i\,y)) = \frac{1}{2}\left(\left(\pi - \frac{\pi\,\operatorname{sgn}(\cos(y)\cosh(x))}{\operatorname{sgn}(\cos(2\,y)+\cosh(2\,x))}\right)\operatorname{sgn}\left(\frac{1}{2} - \frac{\operatorname{sgn}(\sin(y)\sinh(x))}{\operatorname{sgn}(\cos(2\,y)+\cosh(2\,x))}\right) - 2\tan^{-1}(\tan(y)\tanh(x))\right)$$

### Conjugate value

01.24.19.0006.01

$$\overline{\operatorname{sech}(x+i\,y)} = \frac{1}{\cos(y)\cosh(x) - i\sin(y)\sinh(x)}$$

## Differentiation

### Low-order differentiation

01.24.20.0001.01

$$\frac{\partial \operatorname{sech}(z)}{\partial z} = -\operatorname{sech}(z)\tanh(z)$$

01.24.20.0002.01

$$\frac{\partial^2 \operatorname{sech}(z)}{\partial z^2} = \operatorname{sech}(z)\tanh^2(z) - \operatorname{sech}^3(z)$$

### Symbolic differentiation

01.24.20.0003.01

$$\frac{\partial^n \operatorname{sech}(z)}{\partial z^n} = \sum_{k=0}^{\infty} \frac{E_{2k}\,z^{2k-n}}{(2k-n)!} \;/;\; |z| < \frac{\pi}{2} \bigwedge n \in \mathbb{N}^+$$

01.24.20.0006.01

$$\frac{\partial^n \operatorname{sech}(z)}{\partial z^n} = (-1)^n\,i \sum_{k=0}^{n}\left(-\frac{1}{2}\right)^k k!\,\mathcal{S}_n^{(k)}\left(\left(\tanh\left(\frac{1}{4}(-i\,\pi+2\,z)\right)+1\right)\left(1-\tanh\left(\frac{1}{4}(-i\,\pi+2\,z)\right)\right)^k - 2^n(\tanh(z)+1)(1-\tanh(z))^k\right) /;\; n \in \mathbb{N}$$

01.24.20.0004.01

$$\frac{\partial^n \operatorname{sech}(z)}{\partial z^n} = \operatorname{sech}(z)\left(\delta_n + i^n (n+1)! \sum_{k=0}^{n}\sum_{j=0}^{\left\lfloor \frac{k-1}{2}\right\rfloor} \frac{\left((-1)^k\,2^{1-k}(k-2\,j)^n \operatorname{sech}^k(z)\right)\cosh\left(\frac{i\,n\,\pi}{2} - (k-2\,j)\,z\right)}{(k+1)\,j!\,(k-j)!\,(n-k)!}\right) /;\; n \in \mathbb{N}$$

01.24.20.0007.01

$$\frac{\partial^n \operatorname{sech}(z)}{\partial z^n} = \operatorname{sech}(z)\sum_{j=0}^{n}\sum_{k=0}^{j}(-1)^k\binom{n}{j}2^{j-k}\,k!\,\mathcal{S}_j^{(k)}(\tanh(z)+1)^k \;/;\; n \in \mathbb{N}$$

Victor Adamchik (2005)

### Fractional integro-differentiation

01.24.20.0005.01

$$\frac{\partial^{\alpha}\operatorname{sech}(z)}{\partial z^{\alpha}} = \sum_{k=0}^{\infty}\frac{E_{2k}\,z^{2k-\alpha}}{\Gamma(2k-\alpha+1)} \;/;\; |z| < \frac{\pi}{2}$$

## Integration

### Indefinite integration

#### Involving only one direct function

01.24.21.0023.01

$$\int \operatorname{sech}(b+a\,z)\,dz = \frac{2\tan^{-1}\!\left(\tanh\!\left(\frac{1}{2}(b+a\,z)\right)\right)}{a}$$

01.24.21.0024.01

$$\int \operatorname{sech}(a\,z)\,dz = \frac{2\tan^{-1}\!\left(\tanh\!\left(\frac{a\,z}{2}\right)\right)}{a}$$

01.24.21.0025.01

$$\int \operatorname{sech}(z)\,dz = 2\tan^{-1}\!\left(\tanh\!\left(\frac{z}{2}\right)\right)$$

#### Involving one direct function and elementary functions

## Involving power function

Involving power

## Involving $z^n$ and linear arguments

01.24.21.0026.01

$$\int z\operatorname{sech}(b+a\,z)\,dz = -\frac{1}{2a^2}\Big((-2\,i\,b+\pi-2\,i\,a\,z)\left(\log\!\left(1-i\,e^{b+a\,z}\right)-\log\!\left(1+i\,e^{b+a\,z}\right)\right)+ i\,(2\,b+i\,\pi)\log\!\left(\tan\!\left(\frac{1}{4}(-2\,i\,b+\pi-2\,i\,a\,z)\right)\right)+2\,i\left(\operatorname{Li}_2\!\left(-i\,e^{b+a\,z}\right)-\operatorname{Li}_2\!\left(i\,e^{b+a\,z}\right)\right)\Big)$$

01.24.21.0027.01

$$\int z^n\operatorname{sech}(a\,z)\,dz = n!\,2\,e^{a\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}}{(n-j)!\,a^{j+1}}\;{}_{j+2}F_{j+1}\!\left(\frac{1}{2},\,\ldots,\,\frac{1}{2},\,1;\,\frac{3}{2},\,\ldots,\,\frac{3}{2};\,-e^{2\,a\,z}\right) /;\; n\in\mathbb{N}^+$$

01.24.21.0028.01

$$\int z\operatorname{sech}(a\,z)\,dz = -\frac{i\,(a\,z\,(\log(1-i\,e^{-a\,z})-\log(1+i\,e^{-a\,z}))+\operatorname{Li}_2(-i\,e^{-a\,z})-\operatorname{Li}_2(i\,e^{-a\,z}))}{a^2}$$

01.24.21.0029.01

$$\int z^2\operatorname{sech}(a\,z)\,dz = \frac{1}{a^3}\left(i\left(-a^2\,(\log(1-i\,e^{-a\,z})-\log(1+i\,e^{-a\,z}))\,z^2-2\,a\,(\operatorname{Li}_2(-i\,e^{-a\,z})-\operatorname{Li}_2(i\,e^{-a\,z}))\,z-2\operatorname{Li}_3(-i\,e^{-a\,z})+2\operatorname{Li}_3(i\,e^{-a\,z})\right)\right)$$

01.24.21.0030.01

$$\int z^3 \operatorname{sech}(a z) \, dz = \frac{1}{64 a^4} \Big( i \Big( 16 a^4 z^4 + 64 a^3 \log(1 + i e^{-a z}) z^3 - 64 a^3 \log(1 + i e^{a z}) z^3 + 32 a^3 i \pi z^3 - 24 a^2 \pi^2 z^2 + 96 a^2 i \pi \log(1 + i e^{-a z}) z^2 - 96 i a^2 \pi \log(1 - i e^{a z}) z^2 - 192 a^2 \operatorname{Li}_2(-i e^{a z}) z^2 - 8 i a \pi^3 z - 48 a \pi^2 \log(1 + i e^{-a z}) z + 48 a \pi^2 \log(1 - i e^{a z}) z - 192 i a \pi \operatorname{Li}_2(i e^{a z}) z - 384 a \operatorname{Li}_3(-i e^{-a z}) z + 384 a \operatorname{Li}_3(-i e^{a z}) z - 7 \pi^4 - 8 i \pi^3 \log(1 + i e^{-a z}) + 8 i \pi^3 \log(1 + i e^{a z}) - 8 i \pi^3 \log\Big(\cot\Big(\frac{1}{4}(\pi - 2 i a z)\Big)\Big) + 48 (\pi - 2 i a z)^2 \operatorname{Li}_2(-i e^{-a z}) + 48 \pi^2 \operatorname{Li}_2(i e^{a z}) - 192 i \pi \operatorname{Li}_3(-i e^{-a z}) + 192 i \pi \operatorname{Li}_3(i e^{a z}) - 384 \operatorname{Li}_4(-i e^{-a z}) - 384 \operatorname{Li}_4(-i e^{a z}) \Big) \Big)$$

01.24.21.0031.01

$$\int z^4 \operatorname{sech}(a z) \, dz = \frac{1}{80 a^5} \Big( i \Big( 16 a^5 z^5 + 80 a^4 \log(1 + i e^{-a z}) z^4 - 80 a^4 \log(1 + i e^{a z}) z^4 + 40 a^3 \pi^2 z^3 - 320 a^3 \operatorname{Li}_2(-i e^{a z}) z^3 + 40 a^2 i \pi^3 z^2 + 120 a^2 \pi^2 \log(1 + i e^{-a z}) z^2 - 120 a^2 \pi^2 \log(1 - i e^{a z}) z^2 - 960 a^2 \operatorname{Li}_3(-i e^{-a z}) z^2 + 960 a^2 \operatorname{Li}_3(-i e^{a z}) z^2 - 15 a \pi^4 z + 80 a i \pi^3 \log(1 + i e^{-a z}) z - 80 i a \pi^3 \log(1 - i e^{a z}) z - 240 a \pi^2 \operatorname{Li}_2(i e^{a z}) z - 1920 a \operatorname{Li}_4(-i e^{-a z}) z - 1920 a \operatorname{Li}_4(-i e^{a z}) z + 10 i \pi^5 - 15 \pi^4 \log(1 + i e^{-a z}) + 5 \pi^4 \log(1 + i e^{a z}) + 10 \pi^4 \log(1 - i e^{a z}) - 5 \pi^4 \log\Big(\cot\Big(\frac{1}{4}(\pi - 2 i a z)\Big)\Big) + 80 (-i \pi + a z)(\pi - 2 i a z)^2 \operatorname{Li}_2(-i e^{-a z}) - 80 i \pi^3 \operatorname{Li}_2(i e^{a z}) - 240 \pi^2 \operatorname{Li}_3(-i e^{-a z}) + 240 \pi^2 \operatorname{Li}_3(i e^{a z}) - 1920 \operatorname{Li}_5(-i e^{-a z}) + 1920 \operatorname{Li}_5(-i e^{a z}) \Big) \Big)$$

## Involving exponential function

### Involving exp

## Involving $a^{b z}$

01.24.21.0032.01

$$\int a^{b z} \operatorname{sech}(c z) \, dz = \frac{2 e^{z (c + b \log(a))}}{c + b \log(a)} \, {}_2F_1\Big(\frac{c + b \log(a)}{2 c}, 1; \frac{1}{2}\Big(\frac{b \log(a)}{c} + 3\Big); -e^{2 c z}\Big)$$

01.24.21.0033.01

$$\int e^{b z} \operatorname{sech}(a z) \, dz = \frac{2}{a + b} e^{(a+b) z} \, {}_2F_1\Big(\frac{a + b}{2 a}, 1; \frac{3 a + b}{2 a}; -e^{2 a z}\Big)$$

01.24.21.0034.01

$$\int e^{a z} \operatorname{sech}(a z) \, dz = \frac{\log\big(1 + e^{2 a z}\big)}{a}$$

## Involving exponential function and a power function

### Involving exp and power

### Involving $z^n e^{bz}$

01.24.21.0035.01

$$\int z^n e^{bz}\operatorname{sech}(a z)\,dz = n!\,2\,e^{(a+b)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}}{(n-j)!\,(a+b)^{j+1}}\;{}_{j+2}F_{j+1}\!\left(\frac{a+b}{2a},\ldots,\frac{a+b}{2a},1;\frac{3a+b}{2a},\ldots,\frac{3a+b}{2a};-e^{2az}\right)/;\,n\in\mathbb{N}^+$$

01.24.21.0036.01

$$\int z^n e^{-cz}\operatorname{sech}(c z)\,dz = \frac{2z^{1+n}}{1+n}-2\,e^{2cz}\,n!\sum_{j=0}^{n}\frac{(-1)^j 2^{-j-1}c^{-j-1}z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}\!\left(1,\ldots,1,1;2,\ldots,2;-e^{2cz}\right)/;\,n\in\mathbb{N}$$

01.24.21.0037.01

$$\int z^n e^{-cz(2q+1)}\operatorname{sech}(c z)\,dz = 2\,n!\left(\frac{(-1)^q z^{n+1}}{(n+1)!}+(-1)^q e^{2cz}\sum_{j=0}^{n}\frac{(-2c)^{-j-1}z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}\!\left(1,\ldots,1,1;2,\ldots,2;-e^{2cz}\right)-\sum_{j=0}^{n}\sum_{k=0}^{q-1}\frac{(-1)^k e^{2c(k-q)z}(2c(q-k))^{-j-1}z^{n-j}}{(n-j)!}\right)/;\,n\in\mathbb{N}\land q\in\mathbb{N}^+$$

## Arguments involving inverse trigonometric functions

### Involving $\sin^{-1}$

01.24.21.0038.01

$$\int \operatorname{sech}\!\left(\sin^{-1}(z)\right)dz = \frac{1}{2}\left((1+i)\,e^{(1-i)\sin^{-1}(z)}\,{}_2F_1\!\left(\frac{1}{2}-\frac{i}{2},1;\frac{3}{2}-\frac{i}{2};-e^{2\sin^{-1}(z)}\right)+(1-i)\,e^{(1+i)\sin^{-1}(z)}\,{}_2F_1\!\left(\frac{1}{2}+\frac{i}{2},1;\frac{3}{2}+\frac{i}{2};-e^{2\sin^{-1}(z)}\right)\right)$$

01.24.21.0039.01

$$\int \operatorname{sech}\!\left(a\sin^{-1}(z)\right)dz = \frac{1}{a^2+1}\left(e^{-i\sin^{-1}(z)}\left((a+i)\,e^{a\sin^{-1}(z)}\,{}_2F_1\!\left(\frac{a-i}{2a},1;\frac{3}{2}-\frac{i}{2a};-e^{2a\sin^{-1}(z)}\right)+(a-i)\,e^{(a+2i)\sin^{-1}(z)}\,{}_2F_1\!\left(\frac{a+i}{2a},1;\frac{3}{2}+\frac{i}{2a};-e^{2a\sin^{-1}(z)}\right)\right)\right)$$

### Involving $\cos^{-1}$

01.24.21.0040.01

$$\int \operatorname{sech}\!\left(\cos^{-1}(z)\right)dz = \frac{1}{2}\left((1-i)\,e^{(1-i)\cos^{-1}(z)}\,{}_2F_1\!\left(\frac{1}{2}-\frac{i}{2},1;\frac{3}{2}-\frac{i}{2};-e^{2\cos^{-1}(z)}\right)+(1+i)\,e^{(1+i)\cos^{-1}(z)}\,{}_2F_1\!\left(\frac{1}{2}+\frac{i}{2},1;\frac{3}{2}+\frac{i}{2};-e^{2\cos^{-1}(z)}\right)\right)$$

01.24.21.0041.01

$$\int \operatorname{sech}\!\left(a\cos^{-1}(z)\right)dz = \frac{1}{a^2+1}\left(e^{-i\cos^{-1}(z)}\left((1-ia)\,e^{a\cos^{-1}(z)}\,{}_2F_1\!\left(\frac{a-i}{2a},1;\frac{3}{2}-\frac{i}{2a};-e^{2a\cos^{-1}(z)}\right)+(1+ia)\,e^{(a+2i)\cos^{-1}(z)}\,{}_2F_1\!\left(\frac{a+i}{2a},1;\frac{3}{2}+\frac{i}{2a};-e^{2a\cos^{-1}(z)}\right)\right)\right)$$

## Arguments involving inverse hyperbolic functions

### Involving $\sinh^{-1}$

01.24.21.0042.01

$$\int \operatorname{sech}\left(\sinh^{-1}(z)\right) dz == \sinh^{-1}(z)$$

01.24.21.0043.01

$$\int \operatorname{sech}\left(a \sinh^{-1}(z)\right) dz == \frac{1}{a^2-1}\left(e^{-\sinh^{-1}(z)}\left((a+1)\, e^{a \sinh^{-1}(z)}\, {}_2F_1\left(\frac{a-1}{2a}, 1; \frac{3}{2}-\frac{1}{2a}; -e^{2a\sinh^{-1}(z)}\right) + (a-1)\, e^{(a+2)\sinh^{-1}(z)}\, {}_2F_1\left(\frac{a+1}{2a}, 1; \frac{1}{2}\left(3+\frac{1}{a}\right); -e^{2a\sinh^{-1}(z)}\right)\right)\right)$$

### Involving $\cosh^{-1}$

01.24.21.0044.01

$$\int \operatorname{sech}\left(\cosh^{-1}(z)\right) dz == \log(z)$$

01.24.21.0045.01

$$\int \operatorname{sech}\left(a \cosh^{-1}(z)\right) dz == \frac{1}{a^2-1}\left(e^{-\cosh^{-1}(z)}\left((a-1)\, e^{(a+2)\cosh^{-1}(z)}\, {}_2F_1\left(\frac{a+1}{2a}, 1; \frac{1}{2}\left(3+\frac{1}{a}\right); -e^{2a\cosh^{-1}(z)}\right) - (a+1)\, e^{a\cosh^{-1}(z)}\, {}_2F_1\left(\frac{a-1}{2a}, 1; \frac{3}{2}-\frac{1}{2a}; -e^{2a\cosh^{-1}(z)}\right)\right)\right)$$

### Involving $\tanh^{-1}$

01.24.21.0046.01

$$\int \operatorname{sech}\left(\tanh^{-1}(z)\right) dz == \frac{1}{2}\sqrt{1-z^2}\; z + \frac{1}{2}\sin^{-1}(z)$$

### Involving $\coth^{-1}$

01.24.21.0047.01

$$\int \operatorname{sech}\left(\coth^{-1}(z)\right) dz == \frac{z}{\sqrt{z^2-1}}\sqrt{1-\frac{1}{z^2}}\left(\tan^{-1}\left(\frac{1}{\sqrt{z^2-1}}\right) + \sqrt{z^2-1}\right)$$

### Involving $\operatorname{csch}^{-1}$

01.24.21.0048.01

$$\int \operatorname{sech}\left(\operatorname{csch}^{-1}(z)\right) dz == \sqrt{1+\frac{1}{z^2}}\; z$$

### Involving $\operatorname{sech}^{-1}$

01.24.21.0049.01

$$\int \operatorname{sech}\left(\operatorname{sech}^{-1}(z)\right) dz = \frac{z^2}{2}$$

## Involving trigonometric functions

### Involving sin

### Involving sin$(b\,z)$

01.24.21.0050.01

$$\int \sin(b\,z)\operatorname{sech}(c\,z)\,dz = \frac{e^{(c-i\,b)\,z}}{(c+i\,b)\,(b+i\,c)}\left((c-i\,b)\,e^{2\,i\,b\,z}\,{}_2F_1\!\left(\frac{c+i\,b}{2\,c},1;\frac{3}{2}+\frac{i\,b}{2\,c};-e^{2\,c\,z}\right)-(c+i\,b)\,{}_2F_1\!\left(\frac{c-i\,b}{2\,c},1;\frac{3}{2}-\frac{i\,b}{2\,c};-e^{2\,c\,z}\right)\right)$$

### Involving power of sin

### Involving sin$^m(b\,z)$

01.24.21.0051.01

$$\int \sin^m(b\,z)\operatorname{sech}(c\,z)\,dz = \frac{1-m \bmod 2}{2^{m-1}\,c}\binom{m}{\frac{m}{2}}\tan^{-1}\!\left(\tanh\!\left(\frac{c\,z}{2}\right)\right)+ 2^{1-m}\,i^{-m}\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(\frac{e^{(c+b\,i\,(m-2\,k))\,z}}{c+b\,i\,(m-2\,k)}\,{}_2F_1\!\left(1,\frac{c-2\,i\,b\,k+i\,b\,m}{2\,c};\frac{3\,c-2\,i\,b\,k+i\,b\,m}{2\,c};-e^{2\,c\,z}\right)+ \frac{(-1)^m\,e^{(c+2\,i\,b\,k-i\,b\,m)\,z}}{c+2\,i\,b\,k-i\,b\,m}\,{}_2F_1\!\left(1,\frac{c+2\,i\,b\,k-i\,b\,m}{2\,c};\frac{3\,c+2\,i\,b\,k-i\,b\,m}{2\,c};-e^{2\,c\,z}\right)\right)\,/;\,m\in\mathbb{N}^+$$

### Involving cos

### Involving cos$(b\,z)$

01.24.21.0052.01

$$\int \cos(b\,z)\operatorname{sech}(c\,z)\,dz = \frac{e^{(c-i\,b)\,z}}{c^2+b^2}\left((c-i\,b)\,e^{2\,i\,b\,z}\,{}_2F_1\!\left(\frac{c+i\,b}{2\,c},1;\frac{3}{2}+\frac{i\,b}{2\,c};-e^{2\,c\,z}\right)+(c+i\,b)\,{}_2F_1\!\left(\frac{c-i\,b}{2\,c},1;\frac{3}{2}-\frac{i\,b}{2\,c};-e^{2\,c\,z}\right)\right)$$

### Involving power of cos

### Involving cos$^m(b\,z)$

01.24.21.0053.01

$$\int \cos^m(b\,z)\,\text{sech}(c\,z)\,dz = \frac{2^{1-m}\tan^{-1}(e^{c\,z})\,(1 - m \bmod 2)}{c}\binom{m}{\frac{m}{2}} + 2^{1-m}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(\frac{e^{(c - i\,b\,m + 2\,i\,b\,s)\,z}}{c - i\,b\,m + 2\,i\,b\,s}\,{}_2F_1\!\left(1, \frac{c - i\,b\,m + 2\,i\,b\,s}{2\,c}; \frac{3\,c - i\,b\,m + 2\,i\,b\,s}{2\,c}; -e^{2\,c\,z}\right) + \frac{e^{(c + b\,i\,(m - 2\,s))\,z}}{c + b\,i\,(m - 2\,s)}\,{}_2F_1\!\left(1, \frac{c + i\,b\,m - 2\,i\,b\,s}{2\,c}; \frac{3\,c + i\,b\,m - 2\,i\,b\,s}{2\,c}; -e^{2\,c\,z}\right)\right) /; m \in \mathbb{N}^+$$

## Involving trigonometric and a power functions

### Involving sin and power

### Involving $z^n \sin(a + b\,z)$

01.24.21.0054.01

$$\int z^n \sin(a + b\,z)\,\text{sech}(c\,z)\,dz = -i\,e^{i\,a + (c + i\,b)\,z}\,n!\sum_{j=0}^{n}\frac{(-1)^j\,(c + i\,b)^{-j-1}\,z^{n-j}}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{c + i\,b}{2\,c}, \ldots, \frac{c + i\,b}{2\,c}, 1; \frac{c + i\,b}{2\,c} + 1, \ldots, \frac{c + i\,b}{2\,c} + 1; -e^{2\,c\,z}\right) + i\,e^{-i\,a + (c - i\,b)\,z}\,n!\sum_{j=0}^{n}\frac{(-1)^j\,(c - i\,b)^{-j-1}\,z^{n-j}}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{c - i\,b}{2\,c}, \ldots, \frac{c - i\,b}{2\,c}, 1; \frac{c - i\,b}{2\,c} + 1, \ldots, \frac{c - i\,b}{2\,c} + 1; -e^{2\,c\,z}\right) /; n \in \mathbb{N}$$

01.24.21.0055.01

$$\int z^n \sin(b\,z)\,\text{sech}(c\,z)\,dz = i\,n!\left(e^{(c - i\,b)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}}{(n-j)!\,(c - i\,b)^{j+1}}\,{}_{j+2}F_{j+1}\!\left(\frac{c - i\,b}{2\,c}, \ldots, \frac{c - i\,b}{2\,c}, 1; \frac{3\,c - i\,b}{2\,c}, \ldots, \frac{3\,c - i\,b}{2\,c}; -e^{2\,c\,z}\right) - e^{(c + i\,b)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}}{(n-j)!\,(c + i\,b)^{j+1}}\,{}_{j+2}F_{j+1}\!\left(\frac{c + i\,b}{2\,c}, \ldots, \frac{c + i\,b}{2\,c}, 1; \frac{3\,c + i\,b}{2\,c}, \ldots, \frac{3\,c + i\,b}{2\,c}; -e^{2\,c\,z}\right)\right) /; n \in \mathbb{N}^+$$

### Involving power of sin and power

### Involving $z^n \sin^m(b\,z)$

01.24.21.0056.01

$$\int z^n \sin^m(b z) \operatorname{sech}(c z) \, dz = 2^{1-m} e^{c z} \binom{m}{\frac{m}{2}} n! \, (1 - m \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j}}{(n-j)! \, c^{j+1}} \, {}_{j+2}F_{j+1}\left(\frac{1}{2}, \ldots, \frac{1}{2}, 1; \frac{3}{2}, \ldots, \frac{3}{2}; -e^{2 c z}\right) +$$

$$2^{1-m} n! \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left( e^{\frac{i m \pi}{2} + (c - i b (-2 k + m)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{-j+n}}{(n-j)! \, (c - i b (-2 k + m))^{j+1}} \, {}_{j+2}F_{j+1} \right.$$

$$\left( \frac{c - i b (-2 k + m)}{2 c}, \ldots, \frac{c - i b (-2 k + m)}{2 c}, 1; \frac{3 c - i b (-2 k + m)}{2 c}, \ldots, \frac{3 c - i b (-2 k + m)}{2 c}; -e^{2 c z} \right) +$$

$$e^{-\frac{i m \pi}{2} + (c + i b (-2 k + m)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{-j+n}}{(n-j)! \, (c + i b (-2 k + m))^{j+1}} \, {}_{j+2}F_{j+1}\left( \frac{c + i b (-2 k + m)}{2 c}, \ldots, \right.$$

$$\left. \left. \frac{c + i b (-2 k + m)}{2 c}, 1; \frac{3 c + i b (-2 k + m)}{2 c}, \ldots, \frac{3 c + i b (-2 k + m)}{2 c}; -e^{2 c z} \right) \right) /; n \in \mathbb{N}^+ \land m \in \mathbb{N}^+$$

## Involving cos and power

### Involving $z^n \cos(a + b z)$

01.24.21.0057.01

$$\int z^n \cos(a + b z) \operatorname{sech}(c z) \, dz =$$

$$e^{i a + (c + i b) z} n! \sum_{j=0}^{n} \frac{(-1)^j (c + i b)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{c + i b}{2 c}, \ldots, \frac{c + i b}{2 c}, 1; \frac{c + i b}{2 c} + 1, \ldots, \frac{c + i b}{2 c} + 1; -e^{2 c z} \right) +$$

$$e^{-i a + (c - i b) z} n! \sum_{j=0}^{n} \frac{(-1)^j (c - i b)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{c - i b}{2 c}, \ldots, \frac{c - i b}{2 c}, 1; \frac{c - i b}{2 c} + 1, \ldots, \frac{c - i b}{2 c} + 1; -e^{2 c z} \right) /; n \in \mathbb{N}$$

01.24.21.0058.01

$$\int z^n \cos(b z) \operatorname{sech}(c z) \, dz = n! \left( e^{(c - i b) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j}}{(n-j)! \, (c - i b)^{j+1}} \, {}_{j+2}F_{j+1}\left( \frac{c - i b}{2 c}, \ldots, \frac{c - i b}{2 c}, 1; \frac{3 c - i b}{2 c}, \ldots, \frac{3 c - i b}{2 c}; -e^{2 c z} \right) + \right.$$

$$\left. e^{(c + i b) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j}}{(n-j)! \, (c + i b)^{j+1}} \, {}_{j+2}F_{j+1}\left( \frac{c + i b}{2 c}, \ldots, \frac{c + i b}{2 c}, 1; \frac{3 c + i b}{2 c}, \ldots, \frac{3 c + i b}{2 c}; -e^{2 c z} \right) \right) /; n \in \mathbb{N}^+$$

## Involving power of cos and power

### Involving $z^n \cos^m(b z)$

01.24.21.0059.01

$$\int z^n \cos^m(b z)\operatorname{sech}(c z)\,dz = 2^{1-m} e^{c z}\binom{m}{\frac{m}{2}} n!\,(1 - m \bmod 2)\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}}{(n-j)!\,c^{j+1}}\,{}_{j+2}F_{j+1}\left(\frac{1}{2}, \ldots, \frac{1}{2}, 1; \frac{3}{2}, \ldots, \frac{3}{2}; -e^{2 c z}\right) + 2^{1-m} n! \sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\left(e^{(c - i b(-2k+m)) z}\sum_{j=0}^{n}\frac{(-1)^j z^{-j+n}}{(n-j)!\,(c - i b(-2k+m))^{j+1}}\,{}_{j+2}F_{j+1}\left(\frac{c - i b(-2k+m)}{2c}, \ldots, \frac{c - i b(-2k+m)}{2c}, 1; \frac{3c - i b(-2k+m)}{2c}, \ldots, \frac{3c - i b(-2k+m)}{2c}; -e^{2 c z}\right) + e^{(c + i b(-2k+m)) z}\sum_{j=0}^{n}\frac{(-1)^j z^{-j+n}}{(n-j)!\,(c + i b(-2k+m))^{j+1}}\,{}_{j+2}F_{j+1}\left(\frac{c + i b(-2k+m)}{2c}, \ldots, \frac{c + i b(-2k+m)}{2c}, 1; \frac{3c + i b(-2k+m)}{2c}, \ldots, \frac{3c + i b(-2k+m)}{2c}; -e^{2 c z}\right)\right) /; n \in \mathbb{N}^+ \wedge m \in \mathbb{N}^+$$

## Involving trigonometric and exponential functions

### Involving sin and exp

### Involving $e^{p z} \sin(b z)$

01.24.21.0060.01

$$\int e^{p z}\sin(b z)\operatorname{sech}(c z)\,dz = i\left(\frac{e^{(c - i b + p) z}}{c - i b + p}\,{}_2F_1\left(1, \frac{c - i b + p}{2c}; \frac{3c - i b + p}{2c}; -e^{2 c z}\right) - \frac{e^{(c + i b + p) z}}{c + i b + p}\,{}_2F_1\left(1, \frac{c + i b + p}{2c}; \frac{3c + i b + p}{2c}; -e^{2 c z}\right)\right)$$

01.24.21.0061.01

$$\int e^{(i a - c) z}\sin(a z)\operatorname{sech}(c z)\,dz = i z - \frac{e^{2 i a z}}{2a}\,{}_2F_1\left(1, \frac{i a}{c}; 1 + \frac{i a}{c}; -e^{2 c z}\right) - \frac{i \log\left(1 + e^{2 c z}\right)}{2c}$$

01.24.21.0062.01

$$\int e^{-(c + i a) z}\sin(a z)\operatorname{sech}(c z)\,dz = \frac{i \log\left(1 + e^{-2 c z}\right)}{2c} - \frac{e^{-2 i a z}\,{}_2F_1\left(-\frac{i a}{c}, 1; 1 - \frac{i a}{c}; -e^{2 c z}\right)}{2a}$$

### Involving power of sin and exp

### Involving $e^{p z} \sin^m(b z)$

01.24.21.0063.01

$$\int e^{pz}\sin^m(bz)\operatorname{sech}(cz)\,dz = \frac{2^{1-m}e^{(c+p)z}(1-m\bmod 2)}{c+p}\binom{m}{\frac{m}{2}}\,{}_2F_1\left(1,\frac{c+p}{2c};\frac{1}{2}\left(\frac{p}{c}+3\right);-e^{2cz}\right)+$$
$$2^{1-m}\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(\frac{e^{(c-2ibk+p)z-\frac{1}{2}im(\pi-2bz)}}{c-2ibk+ibm+p}\,{}_2F_1\left(1,\frac{c-2ibk+ibm+p}{2c};\frac{3c-2ibk+ibm+p}{2c};-e^{2cz}\right)+\right.$$
$$\left.\frac{e^{(c+2ibk+p)z+\frac{1}{2}im(\pi-2bz)}}{c+2ibk-ibm+p}\,{}_2F_1\left(1,\frac{c+2ibk-ibm+p}{2c};\frac{3c+2ibk-ibm+p}{2c};-e^{2cz}\right)\right)/;\ m\in\mathbb{N}^+$$

Involving cos and exp

## Involving $e^{pz}\cos(bz)$

01.24.21.0064.01

$$\int e^{pz}\cos(bz)\operatorname{sech}(cz)\,dz =$$
$$\frac{e^{(c+ib+p)z}}{c+ib+p}\,{}_2F_1\left(1,\frac{c+ib+p}{2c};\frac{3c+ib+p}{2c};-e^{2cz}\right)+\frac{e^{(c-ib+p)z}}{c-ib+p}\,{}_2F_1\left(1,\frac{c-ib+p}{2c};\frac{3c-ib+p}{2c};-e^{2cz}\right)$$

01.24.21.0065.01

$$\int e^{(ia-c)z}\cos(az)\operatorname{sech}(cz)\,dz = z-\frac{e^{2iaz}i}{2a}\,{}_2F_1\left(1,\frac{ia}{c};1+\frac{ia}{c};-e^{2cz}\right)-\frac{\log\left(1+e^{2cz}\right)}{2c}$$

01.24.21.0066.01

$$\int e^{-(c+ia)z}\cos(az)\operatorname{sech}(cz)\,dz = z+\frac{e^{-2iaz}i}{2a}\,{}_2F_1\left(1,-\frac{ia}{c};1-\frac{ia}{c};-e^{2cz}\right)-\frac{\log\left(1+e^{2cz}\right)}{2c}$$

Involving power of cos and exp

## Involving $e^{pz}\cos^m(bz)$

01.24.21.0067.01

$$\int e^{pz}\cos^m(bz)\operatorname{sech}(cz)\,dz = \frac{2^{1-m}e^{(c+p)z}(1-m\bmod 2)}{c+p}\binom{m}{\frac{m}{2}}\,{}_2F_1\left(1,\frac{c+p}{2c};\frac{1}{2}\left(\frac{p}{c}+3\right);-e^{2cz}\right)+$$
$$2^{1-m}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(\frac{e^{(c+p+bi(m-2s))z}}{c+p+bi(m-2s)}\,{}_2F_1\left(1,\frac{c+p+bi(m-2s)}{2c};\frac{3c+p+bi(m-2s)}{2c};-e^{2cz}\right)+\right.$$
$$\left.\frac{e^{(c+p-ib(m-2s))z}}{c+p-ib(m-2s)}\,{}_2F_1\left(1,\frac{c+p-ib(m-2s)}{2c};\frac{3c+p-ib(m-2s)}{2c};-e^{2cz}\right)\right)/;\ m\in\mathbb{N}^+$$

## Involving trigonometric, exponential and a power functions

Involving sin, exp and power

## Involving $z^n e^{p z} \sin(a + b z) \operatorname{sech}(c z)$

01.24.21.0068.01

$$\int z^n e^{p z} \sin(a+b z) \operatorname{sech}(c z)\, dz = i\, e^{-i a+(c-i b+p) z}\, n! \sum_{j=0}^{n} \frac{(-1)^j (c-i b+p)^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c+p-i b}{2 c}, \ldots, \frac{c+p-i b}{2 c}, 1; \frac{c+p-i b}{2 c}+1, \ldots, \frac{c+p-i b}{2 c}+1; -e^{2 c z}\right) - i\, e^{i a+(c+i b+p) z}\, n! \sum_{j=0}^{n} \frac{(-1)^j (c+i b+p)^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c+p+i b}{2 c}, \ldots, \frac{c+p+i b}{2 c}, 1; \frac{c+p+i b}{2 c}+1, \ldots, \frac{c+p+i b}{2 c}+1; -e^{2 c z}\right) /; n \in \mathbb{N}$$

01.24.21.0069.01

$$\int z^n e^{p z} \sin(b z) \operatorname{sech}(c z)\, dz = n!\, e^{c z}\left(e^{-\frac{1}{2}(i \pi)+(i b+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i b+p+c)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c+p+i b}{2 c}, \ldots, \frac{c+p+i b}{2 c}, 1; \frac{c+p+i b}{2 c}+1, \ldots, \frac{c+p+i b}{2 c}+1; -e^{2 c z}\right) + e^{\frac{i \pi}{2}+(-i b+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i b+p+c)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c+p-i b}{2 c}, \ldots, \frac{c+p-i b}{2 c}, 1; \frac{c+p-i b}{2 c}+1, \ldots, \frac{c+p-i b}{2 c}+1; -e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

01.24.21.0070.01

$$\int z^n e^{(i b-c) z} \sin(b z) \operatorname{sech}(c z)\, dz = i\left(\frac{z^{n+1}}{n+1} - e^{2 c z}\, n! \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (2 c)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(1, \ldots, 1, 1; 2, \ldots, 2; -e^{2 c z}\right) - e^{2 i b z}\, n! \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (2 i b)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{i b}{c}, \ldots, \frac{i b}{c}, 1; \frac{i b}{c}+1, \ldots, \frac{i b}{c}+1; -e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

01.24.21.0071.01

$$\int z^n e^{-(i b+c) z} \sin(b z) \operatorname{sech}(c z)\, dz = i\left(-\frac{z^{n+1}}{n+1} + n!\, e^{2 c z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (2 c)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(1, \ldots, 1, 1; 2, \ldots, 2; -e^{2 c z}\right) - n!\, e^{-2 i b z} \sum_{j=0}^{n} \frac{z^{n-j} (2 i b)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(-\frac{i b}{c}, \ldots, -\frac{i b}{c}, 1; -\frac{i b}{c}+1, \ldots, -\frac{i b}{c}+1; -e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

### Involving powers of sin, exp and power

## Involving $z^n e^{p z} \sin^m(b z) \operatorname{sech}(c z)$

01.24.21.0072.01

$$\int z^n e^{p z} \sin^m(b z) \operatorname{sech}(c z) \, dz = 2^{1-m} e^{(p+c) z} \binom{m}{\frac{m}{2}} n! \, (1 - m \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+c)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c+p}{2c}, \ldots, \frac{c+p}{2c}, 1; \frac{c+p}{2c}+1, \ldots, \frac{c+p}{2c}+1; -e^{2 c z}\right) + 2^{1-m} \, n! \, e^{c z} \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left( e^{(p+b i (m-2k)) z - \frac{i \pi m}{2}} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p + b i (m-2k) + c)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c+p+i b(-2k+m)}{2c}, \ldots, \frac{c+p+i b(-2k+m)}{2c}, 1; \frac{c+p+i b(-2k+m)}{2c}+1, \ldots, \frac{c+p+i b(-2k+m)}{2c}+1; -e^{2 c z}\right) + e^{\frac{i \pi m}{2} + (p - i b (m-2k)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p - i b (m-2k) + c)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c+p-i b(-2k+m)}{2c}, \ldots, \frac{c+p-i b(-2k+m)}{2c}, 1; \frac{c+p-i b(-2k+m)}{2c}+1, \ldots, \frac{c+p-i b(-2k+m)}{2c}+1; -e^{2 c z}\right)\right) /; n \in \mathbb{N} \land m \in \mathbb{N}^+$$

## Involving cos, exp and power

### Involving $z^n e^{p z} \cos(a + b z) \operatorname{sech}(c z)$

01.24.21.0073.01

$$\int z^n e^{p z} \cos(a + b z) \operatorname{sech}(c z) \, dz = e^{-i a + (c - i b + p) z} n! \sum_{j=0}^{n} \frac{(-1)^j (c - i b + p)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c+p-i b}{2c}, \ldots, \frac{c+p-i b}{2c}, 1; \frac{c+p-i b}{2c}+1, \ldots, \frac{c+p-i b}{2c}+1; -e^{2 c z}\right) + e^{i a + (c + i b + p) z} n! \sum_{j=0}^{n} \frac{(-1)^j (c + i b + p)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c+p+i b}{2c}, \ldots, \frac{c+p+i b}{2c}, 1; \frac{c+p+i b}{2c}+1, \ldots, \frac{c+p+i b}{2c}+1; -e^{2 c z}\right) /; n \in \mathbb{N}$$

01.24.21.0074.01

$$\int z^n e^{p z} \cos(b z) \operatorname{sech}(c z) \, dz = n! \, e^{c z} \left( e^{(-i b+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i b+p+c)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{c+p-i b}{2 c}, \ldots, \frac{c+p-i b}{2 c}, 1; \frac{c+p-i b}{2 c}+1, \ldots, \frac{c+p-i b}{2 c}+1; -e^{2 c z} \right) + e^{(i b+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i b+p+c)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{c+p+i b}{2 c}, \ldots, \frac{c+p+i b}{2 c}, 1; \frac{c+p+i b}{2 c}+1, \ldots, \frac{c+p+i b}{2 c}+1; -e^{2 c z} \right) \right) /; n \in \mathbb{N}$$

01.24.21.0075.01

$$\int z^n e^{(i b-c) z} \cos(b z) \operatorname{sech}(c z) \, dz = \frac{z^{n+1}}{n+1} - e^{2 c z} n! \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (2 c)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(1, \ldots, 1, 1; 2, \ldots, 2; -e^{2 c z}\right) + e^{2 i b z} n! \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (2 i b)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{i b}{c}, \ldots, \frac{i b}{c}, 1; \frac{i b}{c}+1, \ldots, \frac{i b}{c}+1; -e^{2 c z} \right) /; n \in \mathbb{N}$$

01.24.21.0076.01

$$\int z^n e^{-(i b+c) z} \cos(b z) \operatorname{sech}(c z) \, dz = \frac{z^{n+1}}{n+1} - n! \, e^{2 c z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (2 c)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(1, \ldots, 1, 1; 2, \ldots, 2; -e^{2 c z}\right) - n! \, e^{-2 i b z} \sum_{j=0}^{n} \frac{z^{n-j} (2 i b)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( -\frac{i b}{c}, \ldots, -\frac{i b}{c}, 1; -\frac{i b}{c}+1, \ldots, -\frac{i b}{c}+1; -e^{2 c z} \right) /; n \in \mathbb{N}$$

## Involving powers of cos, exp and power

### Involving $z^n e^{p z} \cos^m(b z) \operatorname{sech}(c z)$

01.24.21.0077.01

$$\int z^n e^{pz}\cos^m(bz)\operatorname{sech}(cz)\,dz = e^{(p+c)z}\binom{m}{\frac{m}{2}}2^{1-m}\,n!\,(1-m \bmod 2)\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p+c)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{c+p}{2c},\ldots,\frac{c+p}{2c},1;\frac{c+p}{2c}+1,\ldots,\frac{c+p}{2c}+1;-e^{2cz}\right)+$$
$$2^{1-m}\,n!\,e^{cz}\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\left(e^{(p+ib(m-2k))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p+ib(m-2k)+c)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{c+p+ib(-2k+m)}{2c},\ldots,\frac{c+p+ib(-2k+m)}{2c},1;\frac{c+p+ib(-2k+m)}{2c}+1,\ldots,\frac{c+p+ib(-2k+m)}{2c}+1;-e^{2cz}\right)+e^{(p-ib(m-2k))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p-ib(m-2k)+c)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{c+p-ib(-2k+m)}{2c},\ldots,\frac{c+p-ib(-2k+m)}{2c},1;\frac{c+p-ib(-2k+m)}{2c}+1,\ldots,\frac{c+p-ib(-2k+m)}{2c}+1;-e^{2cz}\right)\right)\;/;\;n\in\mathbb{N}\land m\in\mathbb{N}^+$$

## Involving hyperbolic functions

### Involving sinh

### Involving sinh($b\,z$)

01.24.21.0078.01

$$\int\sinh(bz)\operatorname{sech}(cz)\,dz = \frac{e^{(c-b)z}}{(c-b)(c+b)}\left((c-b)\,e^{2bz}\,{}_2F_1\left(\frac{c+b}{2c},1;\frac{3c+b}{2c};-e^{2cz}\right)-(c+b)\,{}_2F_1\left(\frac{c-b}{2c},1;\frac{3}{2}-\frac{b}{2c};-e^{2cz}\right)\right)$$

01.24.21.0079.01

$$\int\sinh(z)\operatorname{sech}(z)\,dz = \log(\cosh(z))$$

01.24.21.0080.01

$$\int\sinh(z)\operatorname{sech}(2z)\,dz = \frac{-i\tan^{-1}\left(-\tanh\left(\frac{z}{2}\right)-i\sqrt{2}\right)-\tanh^{-1}\left(i\tanh\left(\frac{z}{2}\right)+\sqrt{2}\right)}{\sqrt{2}}$$

01.24.21.0081.01

$$\int\sinh(z)\operatorname{sech}(3z)\,dz = \frac{1}{6}\left(\log(2\cosh(2z)-1)-2\log(\cosh(z))\right)$$

01.24.21.0082.01

$$\int\sinh(z)\operatorname{sech}(4z)\,dz = \frac{1}{15}e^{3z}\left(3e^{2z}\,{}_2F_1\left(\frac{5}{8},1;\frac{13}{8};-e^{8z}\right)-5\,{}_2F_1\left(\frac{3}{8},1;\frac{11}{8};-e^{8z}\right)\right)$$

01.24.21.0083.01

$$\int\sinh(2z)\operatorname{sech}(z)\,dz = 2\cosh(z)$$

01.24.21.0084.01

$$\int \sinh(3\,z)\,\operatorname{sech}(z)\,dz = \cosh(2\,z) - \log(\cosh(z))$$

01.24.21.0085.01

$$\int \sinh(4\,z)\,\operatorname{sech}(z)\,dz = \frac{2}{3}\,(\cosh(3\,z) - 3\cosh(z))$$

## Involving power of sinh

### Involving $\sinh^{\mu}(b\,z)$

01.24.21.0086.01

$$\int \sinh^m(b\,z)\,\operatorname{sech}(c\,z)\,dz = \binom{m}{\frac{m}{2}}\frac{i^m\,(1 - m \bmod 2)\tan^{-1}\!\left(\tanh\!\left(\frac{c\,z}{2}\right)\right)}{2^{m-1}\,c} + 2^{1-m}\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(\frac{e^{(c+b\,(m-2\,k))\,z}}{c+b\,(m-2\,k)}\,{}_2F_1\!\left(1, \frac{c-2\,b\,k+b\,m}{2\,c}; \frac{3\,c-2\,b\,k+b\,m}{2\,c}; -e^{2\,c\,z}\right) + \frac{(-1)^m\,e^{(c+2\,b\,k-b\,m)\,z}}{c+2\,b\,k-b\,m}\,{}_2F_1\!\left(1, \frac{c+2\,b\,k-b\,m}{2\,c}; \frac{3\,c+2\,b\,k-b\,m}{2\,c}; -e^{2\,c\,z}\right)\right) /;\; m \in \mathbb{N}^+$$

01.24.21.0087.01

$$\int \sinh^{\mu}(c\,z)\,\operatorname{sech}(c\,z)\,dz = \frac{\operatorname{sech}^2(c\,z)\sinh^{\mu+1}(c\,z)\tanh^2(c\,z)^{-\frac{\mu}{2}-\frac{1}{2}}}{c\,\mu - c}\,{}_2F_1\!\left(\frac{1}{2}-\frac{\mu}{2}, \frac{1}{2}-\frac{\mu}{2}; \frac{3}{2}-\frac{\mu}{2}; \operatorname{sech}^2(c\,z)\right)$$

01.24.21.0088.01

$$\int \sinh^2(z)\,\operatorname{sech}(2\,z)\,dz = \frac{1}{2}\left(z - \tan^{-1}(\tanh(z))\right)$$

01.24.21.0089.01

$$\int \sinh^3(z)\,\operatorname{sech}(3\,z)\,dz = \frac{1}{24}\,(8\log(\cosh(z)) - \log(2\cosh(2\,z) - 1))$$

01.24.21.0090.01

$$\int \sinh^{\frac{1}{2}}(c\,z)\,\operatorname{sech}(c\,z)\,dz = -\frac{2\,\operatorname{sech}^2(c\,z)\sinh^{\frac{3}{2}}(c\,z)}{c\tanh^2(c\,z)^{3/4}}\,{}_2F_1\!\left(\frac{1}{4}, \frac{1}{4}; \frac{5}{4}; \operatorname{sech}^2(c\,z)\right)$$

01.24.21.0091.01

$$\int \frac{\operatorname{sech}(c\,z)}{\sinh^{\frac{1}{2}}(c\,z)}\,dz = -\frac{2\tanh^2(c\,z)^{3/4}}{3\,c\sinh^{\frac{3}{2}}(c\,z)}\,{}_2F_1\!\left(\frac{3}{4}, \frac{3}{4}; \frac{7}{4}; \operatorname{sech}^2(c\,z)\right)$$

01.24.21.0092.01

$$\int \frac{\operatorname{sech}(c\,z)}{\sqrt{\sinh^3(2\,c\,z)}}\,dz = -\frac{2\,(2\cosh(2\,c\,z)+1)\sinh(c\,z)}{3\,c\sqrt{\sinh^3(2\,c\,z)}}$$

## Involving rational functions of sinh

## Involving $\frac{1}{a+b\sinh(d\, z)}$

01.24.21.0093.01

$$\int \frac{\operatorname{sech}(z)}{a+b\sinh(z)}\,dz = \frac{2\,a\tan^{-1}\left(\tanh\left(\frac{z}{2}\right)\right)-b\log(\cosh(z))+b\log(a+b\sinh(z))}{a^2+b^2}$$

01.24.21.0094.01

$$\int \frac{A+B\operatorname{sech}(z)}{a+b\sinh(z)}\,dz = -\frac{1}{\left(-a^2-b^2\right)^{3/2}} \left(2\,A\left(a^2+b^2\right)\tan^{-1}\left(\frac{b-a\tanh\left(\frac{z}{2}\right)}{\sqrt{-a^2-b^2}}\right)+2\,a\sqrt{-a^2-b^2}\,B\tan^{-1}\left(\tanh\left(\frac{z}{2}\right)\right)+b\sqrt{-a^2-b^2}\,B\left(\log(a+b\sinh(z))-\log(\cosh(z))\right)\right)$$

01.24.21.0095.01

$$\int \frac{(A+B\sinh(z))\operatorname{sech}(z)}{a+b\sinh(z)}\,dz = \frac{2\,(a\,A+b\,B)\tan^{-1}\left(\tanh\left(\frac{z}{2}\right)\right)-(A\,b-a\,B)\left(\log(\cosh(z))-\log(a+b\sinh(z))\right)}{a^2+b^2}$$

# Involving algebraic functions of sinh

## Involving $(a+b\sinh(c\, z))^{\beta}$

01.24.21.0096.01

$$\int (a+b\sinh(c\,z))^{\beta}\operatorname{sech}(c\,z)\,dz = \frac{(a+b\sinh(c\,z))^{\beta+1}}{2\,(a-i\,b)\,(a+i\,b)\,c\,(\beta+1)}\left((b+i\,a)\,{}_2F_1\left(\beta+1,\,1;\,\beta+2;\,\frac{a+b\sinh(c\,z)}{a+i\,b}\right)+(b-i\,a)\,{}_2F_1\left(\beta+1,\,1;\,\beta+2;\,\frac{a+b\sinh(c\,z)}{a-i\,b}\right)\right)$$

01.24.21.0097.01

$$\int \sqrt{a+b\sinh(c\,z)}\,\operatorname{sech}(c\,z)\,dz = \frac{i\sqrt{a-i\,b}\,(a+i\,b)\tanh^{-1}\left(\frac{\sqrt{a+b\sinh(c\,z)}}{\sqrt{a+i\,b}}\right)-i\,(a-i\,b)\sqrt{a+i\,b}\,\tanh^{-1}\left(\frac{\sqrt{a+b\sinh(c\,z)}}{\sqrt{a-i\,b}}\right)}{\sqrt{a-i\,b}\,\sqrt{a+i\,b}\,c}$$

01.24.21.0098.01

$$\int \frac{\operatorname{sech}(c\,z)}{\sqrt{a+b\sinh(c\,z)}}\,dz = \frac{i}{c}\left(\frac{1}{\sqrt{a+i\,b}}\tanh^{-1}\left(\frac{\sqrt{a+b\sinh(c\,z)}}{\sqrt{a+i\,b}}\right)-\frac{1}{\sqrt{a-i\,b}}\tanh^{-1}\left(\frac{\sqrt{a+b\sinh(c\,z)}}{\sqrt{a-i\,b}}\right)\right)$$

# Involving cosh

## Involving $\cosh(b\, z)$

01.24.21.0099.01

$$\int \cosh(b\,z)\operatorname{sech}(c\,z)\,dz = \frac{e^{(c-b)\,z}}{(c-b)\,(c+b)}\left((c+b)\,{}_2F_1\left(\frac{c-b}{2\,c},\,1;\,\frac{3}{2}-\frac{b}{2\,c};\,-e^{2\,c\,z}\right)+(c-b)\,e^{2\,b\,z}\,{}_2F_1\left(\frac{c+b}{2\,c},\,1;\,\frac{3\,c+b}{2\,c};\,-e^{2\,c\,z}\right)\right)$$

01.24.21.0100.01

$$\int \cosh(z)\,\operatorname{sech}(z)\,dz = z$$

01.24.21.0101.01

$$\int \cosh(z)\,\operatorname{sech}(2z)\,dz = \frac{\tan^{-1}\left(\sqrt{2}\,\sinh(z)\right)}{\sqrt{2}}$$

01.24.21.0102.01

$$\int \cosh(z)\,\operatorname{sech}(3z)\,dz = \frac{\tan^{-1}\left(\sqrt{3}\,\tanh(z)\right)}{\sqrt{3}}$$

01.24.21.0103.01

$$\int \cosh(z)\,\operatorname{sech}(4z)\,dz = \frac{1}{15}\,e^{3z}\left(5\,{}_2F_1\left(\frac{3}{8},1;\frac{11}{8};-e^{8z}\right)+3\,e^{2z}\,{}_2F_1\left(\frac{5}{8},1;\frac{13}{8};-e^{8z}\right)\right)$$

01.24.21.0104.01

$$\int \cosh(2z)\,\operatorname{sech}(z)\,dz = 2\left(\sinh(z)-\tan^{-1}\left(\tanh\left(\frac{z}{2}\right)\right)\right)$$

01.24.21.0105.01

$$\int \cosh(3z)\,\operatorname{sech}(z)\,dz = \sinh(2z)-z$$

01.24.21.0106.01

$$\int \cosh(4z)\,\operatorname{sech}(z)\,dz = \frac{2}{3}\left(3\tan^{-1}\left(\tanh\left(\frac{z}{2}\right)\right)-3\sinh(z)+\sinh(3z)\right)$$

## Involving power of cosh

### Involving $\cosh^{\mu}(b\,z)$

01.24.21.0107.01

$$\int \cosh^m(b\,z)\,\operatorname{sech}(c\,z)\,dz = \binom{m}{\frac{m}{2}}\frac{2^{1-m}\tan^{-1}(e^{cz})\,(1-m \bmod 2)}{c}+2^{1-m}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(\frac{e^{(c-b\,m+2\,b\,s)z}}{c-b\,m+2\,b\,s}\,{}_2F_1\left(1,\frac{c-b\,m+2\,b\,s}{2\,c};\frac{3\,c-b\,m+2\,b\,s}{2\,c};-e^{2cz}\right)+\frac{e^{(c+b\,(m-2\,s))z}}{c+b\,(m-2\,s)}\,{}_2F_1\left(1,\frac{c+b\,m-2\,b\,s}{2\,c};\frac{3\,c+b\,m-2\,b\,s}{2\,c};-e^{2cz}\right)\right)\;/;\;m\in\mathbb{N}^+$$

01.24.21.0108.01

$$\int \cosh^{\mu}(c\,z)\,\operatorname{sech}(c\,z)\,dz = \frac{\cosh^{\mu}(c\,z)\,\operatorname{csch}(c\,z)\,\sqrt{-\sinh^2(c\,z)}}{c\,\mu}\,{}_2F_1\left(\frac{\mu}{2},\frac{1}{2};\frac{\mu+2}{2};\cosh^2(c\,z)\right)$$

01.24.21.0109.01

$$\int \sqrt{\cosh^2(z)}\,\operatorname{sech}(z)\,dz = z\sqrt{\cosh^2(z)}\,\operatorname{sech}(z)$$

01.24.21.0110.01

$$\int \cosh^2(z)\,\operatorname{sech}(3z)\,dz = \frac{1}{2}\tan^{-1}(2\sinh(z))$$

01.24.21.0111.01

$$\int \cosh^{\frac{1}{2}}(c\,z)\,\operatorname{sech}(c\,z)\,dz = -\frac{2\,i}{c}\,F\!\left(\frac{i\,c\,z}{2}\,\middle|\,2\right)$$

01.24.21.0112.01

$$\int \frac{\operatorname{sech}(c\,z)}{\cosh^{\frac{1}{2}}(c\,z)}\,dz = \frac{1}{c}\left(2\,i\,E\!\left(\frac{i\,c\,z}{2}\,\middle|\,2\right) + \frac{2\sinh(c\,z)}{\cosh^{\frac{1}{2}}(c\,z)}\right)$$

01.24.21.0113.01

$$\int \cosh^{\frac{1}{2}}(2\,c\,z)\,\operatorname{sech}(c\,z)\,dz = \frac{\sqrt{2}\,\sinh^{-1}\!\left(\sqrt{2}\,\sinh(c\,z)\right) - \tanh^{-1}\!\left(\frac{\sinh(c\,z)}{\cosh^{\frac{1}{2}}(2\,c\,z)}\right)}{c}$$

01.24.21.0114.01

$$\int \frac{\operatorname{sech}(c\,z)}{\cosh^{\frac{1}{2}}(2\,c\,z)}\,dz = \frac{1}{c}\tanh^{-1}\!\left(\frac{\sinh(c\,z)}{\cosh^{\frac{1}{2}}(2\,c\,z)}\right)$$

## Involving rational functions of cosh

### Involving $\frac{1}{a+b\cosh(d\,z)}$

01.24.21.0115.01

$$\int \frac{\operatorname{sech}(z)}{a+b\cosh(z)}\,dz = \frac{2}{a}\left(\frac{b}{\sqrt{b^2-a^2}}\tan^{-1}\!\left(\frac{(a-b)\tanh\left(\frac{z}{2}\right)}{\sqrt{b^2-a^2}}\right) + \tan^{-1}\!\left(\tanh\left(\frac{z}{2}\right)\right)\right)$$

01.24.21.0116.01

$$\int \frac{A+B\operatorname{sech}(z)}{a+b\cosh(z)}\,dz = \frac{2}{a\sqrt{b^2-a^2}}\left((b\,B-a\,A)\tan^{-1}\!\left(\frac{(a-b)\tanh\left(\frac{z}{2}\right)}{\sqrt{b^2-a^2}}\right) + \sqrt{b^2-a^2}\,B\tan^{-1}\!\left(\tanh\left(\frac{z}{2}\right)\right)\right)$$

## Involving algebraic functions of cosh

### Involving $(a+b\cosh(c\,z))^{\beta}$

01.24.21.0117.01

$$\int \sqrt{a+b\cosh(c\,z)}\,\operatorname{sech}(c\,z)\,dz = -\frac{2\,i\sqrt{\frac{a+b\cosh(c\,z)}{a+b}}\left(b\,F\!\left(\frac{i\,c\,z}{2}\,\middle|\,\frac{2\,b}{a+b}\right) + a\,\Pi\!\left(2;\,\frac{i\,c\,z}{2}\,\middle|\,\frac{2\,b}{a+b}\right)\right)}{c\sqrt{a+b\cosh(c\,z)}}$$

01.24.21.0118.01

$$\int \sqrt{\cosh(c\,z)\,a+a}\,\operatorname{sech}(c\,z)\,dz = \frac{\sqrt{2}\,\tan^{-1}\!\left(\sqrt{2}\,\sinh\left(\frac{c\,z}{2}\right)\right)\sqrt{a\,(\cosh(c\,z)+1)}\,\operatorname{sech}\left(\frac{c\,z}{2}\right)}{c}$$

01.24.21.0119.01

$$\int \sqrt{a-a\cosh(cz)}\,\operatorname{sech}(cz)\,dz = -\frac{1}{c}\left(i\sqrt{2}\left(\tan^{-1}\left(-i\sqrt{2}-\tanh\left(\frac{cz}{4}\right)\right)-i\tanh^{-1}\left(i\tanh\left(\frac{cz}{4}\right)+\sqrt{2}\right)\right)\sqrt{a-a\cosh(cz)}\,\operatorname{csch}\left(\frac{cz}{2}\right)\right)$$

01.24.21.0120.01

$$\int \frac{\operatorname{sech}(cz)}{\sqrt{a+b\cosh(cz)}}\,dz = -\frac{2i\sqrt{\frac{a+b\cosh(cz)}{a+b}}\,\Pi\left(2;\frac{icz}{2}\,\middle|\,\frac{2b}{a+b}\right)}{c\sqrt{a+b\cosh(cz)}}$$

01.24.21.0121.01

$$\int \frac{\operatorname{sech}(cz)}{\sqrt{\cosh(cz)\,a+a}}\,dz = \frac{2\left(\sqrt{2}\tan^{-1}\left(\sqrt{2}\sinh\left(\frac{cz}{2}\right)\right)-2\tan^{-1}\left(\tanh\left(\frac{cz}{4}\right)\right)\right)\cosh\left(\frac{cz}{2}\right)}{c\sqrt{a(\cosh(cz)+1)}}$$

01.24.21.0122.01

$$\int \frac{\operatorname{sech}(cz)}{\sqrt{a-a\cosh(cz)}}\,dz = \frac{2\sinh\left(\frac{cz}{2}\right)}{c\sqrt{a-a\cosh(cz)}}\left(\sqrt{2}\,i\tan^{-1}\left(-i\sqrt{2}-\tanh\left(\frac{cz}{4}\right)\right)+\sqrt{2}\tanh^{-1}\left(i\tanh\left(\frac{cz}{4}\right)+\sqrt{2}\right)-\log\left(\cosh\left(\frac{cz}{4}\right)\right)+\log\left(\sinh\left(\frac{cz}{4}\right)\right)\right)$$

## Involving $(a+b\cosh(2cz))^{\beta}$

01.24.21.0123.01

$$\int (a+b\cosh(2cz))^{\beta}\operatorname{sech}(cz)\,dz = \frac{(a+b\cosh(2cz))^{\beta}\operatorname{csch}(cz)\left(\frac{(a-b)\operatorname{sech}^2(cz)}{2b}+1\right)^{-\beta}\sqrt{\tanh^2(cz)}}{2c\beta-c}\,F_1\left(\frac{1}{2}-\beta;\frac{1}{2},-\beta;\frac{3}{2}-\beta;\operatorname{sech}^2(cz),\frac{(b-a)\operatorname{sech}^2(cz)}{2b}\right)$$

01.24.21.0124.01

$$\int \sqrt{a+b\cosh(2cz)}\,\operatorname{sech}(cz)\,dz = \frac{\frac{\sqrt{2}\sqrt{b}\sqrt{a+b}\sqrt{\frac{a+b\cosh(2cz)}{a+b}}\sinh^{-1}\left(\frac{\sqrt{2}\sqrt{b}\sinh(cz)}{\sqrt{a+b}}\right)}{\sqrt{a+b\cosh(2cz)}}+\sqrt{a-b}\tan^{-1}\left(\frac{\sqrt{a-b}\sinh(cz)}{\sqrt{a+b\cosh(2cz)}}\right)}{c}$$

01.24.21.0125.01

$$\int \sqrt{\cosh(2cz)\,a+a}\,\operatorname{sech}(cz)\,dz = z\sqrt{\cosh(2cz)\,a+a}\,\operatorname{sech}(cz)$$

01.24.21.0126.01

$$\int \sqrt{a-a\cosh(2cz)}\,\operatorname{sech}(cz)\,dz = \frac{\sqrt{a-a\cosh(2cz)}\,\operatorname{csch}(cz)\log(\cosh(cz))}{c}$$

01.24.21.0127.01

$$\int \frac{\operatorname{sech}(cz)}{\sqrt{a+b\cosh(2cz)}}\,dz = \frac{1}{\sqrt{a-b}\,c}\tan^{-1}\left(\frac{\sqrt{a-b}\sinh(cz)}{\sqrt{a+b\cosh(2cz)}}\right)$$

## Involving tanh

### Involving tanh($c\,z$)

01.24.21.0128.01

$$\int \tanh(c\,z)\,\text{sech}(c\,z)\,dz = -\frac{\text{sech}(c\,z)}{c}$$

01.24.21.0129.01

$$\int \tanh(z)\,\text{sech}(2\,z)\,dz = \frac{1}{2}\log(\cosh(2\,z)) - \log(\cosh(z))$$

## Involving power of tanh

### Involving $\tanh^{\mu}(c\,z)$

01.24.21.0130.01

$$\int \tanh^{\mu}(c\,z)\,\text{sech}(c\,z)\,dz = \frac{\sinh(c\,z)\left(-\sinh^2(c\,z)\right)^{\frac{1}{2}(-\mu-1)}\tanh^{\mu}(c\,z)}{c\,\mu}\,{}_2F_1\!\left(-\frac{\mu}{2},\frac{1}{2}-\frac{\mu}{2};1-\frac{\mu}{2};\cosh^2(c\,z)\right)$$

01.24.21.0131.01

$$\int \tanh^2(c\,z)\,\text{sech}(c\,z)\,dz = \frac{2\tan^{-1}\!\left(\tanh\!\left(\frac{c\,z}{2}\right)\right) - \text{sech}(c\,z)\tanh(c\,z)}{2\,c}$$

01.24.21.0132.01

$$\int \tanh^3(c\,z)\,\text{sech}(c\,z)\,dz = \frac{\text{sech}(c\,z)\left(\text{sech}^2(c\,z) - 3\right)}{3\,c}$$

## Involving coth

### Involving coth($c\,z$)

01.24.21.0133.01

$$\int \coth(c\,z)\,\text{sech}(c\,z)\,dz = \frac{1}{c}\log\!\left(\tanh\!\left(\frac{c\,z}{2}\right)\right)$$

## Involving power of coth

### Involving $\coth^{\mu}(c\,z)$

01.24.21.0134.01

$$\int \coth^{\mu}(c\,z)\,\text{sech}(c\,z)\,dz = -\frac{\coth^{\mu}(c\,z)\sinh(c\,z)\left(-\sinh^2(c\,z)\right)^{\frac{\mu-1}{2}}}{c\,\mu}\,{}_2F_1\!\left(\frac{\mu}{2},\frac{\mu+1}{2};\frac{\mu+2}{2};\cosh^2(c\,z)\right)$$

01.24.21.0135.01

$$\int \coth^2(c\,z)\,\text{sech}(c\,z)\,dz = -\frac{\text{csch}(c\,z)}{c}$$

01.24.21.0136.01

$$\int \coth^3(c z) \operatorname{sech}(c z) \, dz = -\frac{\coth(c z) \operatorname{csch}(c z) + \log\left(\cosh\left(\frac{c z}{2}\right)\right) - \log\left(\sinh\left(\frac{c z}{2}\right)\right)}{2 c}$$

## Involving csch

### Involving csch$(c z)$

01.24.21.0137.01

$$\int \operatorname{csch}(c z) \operatorname{sech}(c z) \, dz = \frac{\log(\sinh(c z)) - \log(\cosh(c z))}{c}$$

## Involving power of csch

### Involving csch$^\mu(c z)$

01.24.21.0138.01

$$\int \operatorname{csch}^\mu(c z) \operatorname{sech}(c z) \, dz = \frac{\operatorname{csch}^{\mu+1}(c z) \left(-\sinh^2(c z)\right)^{\frac{\mu+1}{2}}}{4 c} \left((\mu+1) \, {}_3F_2\left(1, 1, \frac{\mu}{2} + \frac{3}{2}; 2, 2; \cosh^2(c z)\right) \cosh^2(c z) + 4 \log(\cosh(c z))\right)$$

01.24.21.0139.01

$$\int \operatorname{csch}^2(c z) \operatorname{sech}(c z) \, dz = -\frac{2 \tan^{-1}\left(\tanh\left(\frac{c z}{2}\right)\right) + \operatorname{csch}(c z)}{c}$$

01.24.21.0140.01

$$\int \operatorname{csch}^3(c z) \operatorname{sech}(c z) \, dz = -\frac{\operatorname{csch}^2(c z) - 2 \log(\cosh(c z)) + 2 \log(\sinh(c z))}{2 c}$$

01.24.21.0141.01

$$\int \operatorname{csch}^4(c z) \operatorname{sech}(c z) \, dz = \frac{-\operatorname{csch}^3(c z) + 3 \operatorname{csch}(c z) + 6 \tan^{-1}\left(\tanh\left(\frac{c z}{2}\right)\right)}{3 c}$$

01.24.21.0142.01

$$\int \operatorname{csch}^3\left(z + \frac{\pi}{4}\right) \operatorname{sech}\left(z + \frac{\pi}{4}\right) dz = -\frac{1}{2} \operatorname{csch}^2\left(z + \frac{\pi}{4}\right) + \log\left(\cosh\left(z + \frac{\pi}{4}\right)\right) - \log\left(\sinh\left(z + \frac{\pi}{4}\right)\right)$$

## Involving sinh and cosh

01.24.21.0143.01

$$\int \frac{(A + B \sinh(z)) \operatorname{sech}(z)}{a + b \cosh(z)} \, dz = \frac{2 A \tan^{-1}\left(\tanh\left(\frac{z}{2}\right)\right) + \frac{2 A b \tan^{-1}\left(\frac{(a-b) \tanh\left(\frac{z}{2}\right)}{\sqrt{b^2 - a^2}}\right)}{\sqrt{b^2 - a^2}} + B (\log(\cosh(z)) - \log(a + b \cosh(z)))}{a}$$

01.24.21.0144.01

$$\int \sqrt{\sinh(c z) \cosh(c z)} \operatorname{sech}(c z) \, dz = \frac{\sqrt{2} \operatorname{csch}(c z) \sqrt[4]{-\sinh^2(c z)} \sinh^{\frac{1}{2}}(2 c z)}{c} \, {}_2F_1\left(\frac{1}{4}, \frac{1}{4}; \frac{5}{4}; \cosh^2(c z)\right)$$

01.24.21.0145.01

$$\int \frac{\operatorname{sech}(z)}{\sqrt{a \cosh^2(z)+b \sinh(z) \cosh(z)+c \sinh^2(z)}}\, dz = =$$

$$-\Big(4 \sqrt{2}\, (\cosh(z)+1) \big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 1]-$$
$$\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 4]\big)$$
$$\Big(F\Big(\sin^{-1}\Big(\sqrt{\Big(\Big(\big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 4]-\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+}$$
$$4 c \#1^2+2 b \#1+a \&, 2]\big) \Big(\tanh\Big(\frac{z}{2}\Big)-\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+$$
$$2 b \#1+a \&, 1]\Big)\Big) \Big/ \Big(\big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&,$$
$$1]-\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 4]\big)$$
$$\Big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]-\tanh\Big(\frac{z}{2}\Big)\Big)\Big)\Big)}\Big)\Big) \Big|$$
$$\big(\big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]-\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+$$
$$4 c \#1^2+2 b \#1+a \&, 3]\big) \big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&,$$
$$1]-\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 4]\big)\big) /$$
$$\big(\big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 1]-\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+$$
$$4 c \#1^2+2 b \#1+a \&, 3]\big) \big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&,$$
$$2]-\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 4]\big)\big)\Big) \Big/$$
$$\big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 4]-\text{Root}[$$
$$a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]\big)-$$
$$\Big(i \Big(F\Big(\sin^{-1}\Big(\sqrt{\Big(\Big(\big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]-\text{Root}[}$$
$$a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 4]\big)$$
$$\Big(\tanh\Big(\frac{z}{2}\Big)-\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 1]\Big)\Big) \Big/$$
$$\Big(\big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 1]-$$
$$\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 4]\big)$$
$$\Big(\tanh\Big(\frac{z}{2}\Big)-\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]\Big)\Big)\Big)}\Big)\Big) \Big|$$
$$-\big(\big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]-\text{Root}[a \#1^4+2 b \#1^3+$$
$$2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 3]\big) \big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+$$
$$2 b \#1+a \&, 1]-\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&,$$
$$4]\big)\big) / \big(\big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 3]-$$
$$\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 1]\big)$$
$$\big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]-$$
$$\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 4]\big)\big)\Big)$$
$$\big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 1]-i\big)+$$
$$\Pi\Big(\big(\big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]-i\big)$$
$$\big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 1]-$$

$$\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,4\right]\big)\big)\Big/$$

$$\Big(\big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,1\right]-i\big)$$

$$\big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,2\right]-$$

$$\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,4\right]\big)\Big);$$

$$\sin^{-1}\Bigg(\sqrt{\Bigg(\Bigg(\Big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,2\right]-}$$

$$\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,4\right]\Big)$$

$$\left(\tanh\left(\frac{z}{2}\right)-\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,1\right]\right)\Bigg)\Bigg/$$

$$\Bigg(\Big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,1\right]-$$

$$\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,4\right]\Big)$$

$$\left(\tanh\left(\frac{z}{2}\right)-\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,2\right]\right)\Bigg)\Bigg)}\Bigg)\Bigg|$$

$$-\Big(\big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,2\right]-\text{Root}\big[$$

$$a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,3\big]\big)$$

$$\big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,1\right]-$$

$$\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,4\right]\big)\Big)\Big/$$

$$\Big(\big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,3\right]-$$

$$\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,1\right]\big)$$

$$\big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,2\right]-$$

$$\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,4\right]\big)\Big)\Bigg)$$

$$\big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,2\right]-\text{Root}\big[$$

$$a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,1\big]\big)\Big)\Big)\Big/$$

$$\Big(\big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,1\right]-i\big)$$

$$\big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,2\right]-i\big)$$

$$\big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,2\right]-$$

$$\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,4\right]\big)\Big)+$$

$$\Bigg(i\,\Bigg(F\Bigg(\sin^{-1}\Bigg(\sqrt{\Bigg(\Bigg(\Big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,2\right]-\text{Root}\big[}$$

$$a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,4\big]\Big)$$

$$\left(\tanh\left(\frac{z}{2}\right)-\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,1\right]\right)\Bigg)\Bigg/$$

$$\Bigg(\Big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,1\right]-$$

$$\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,4\right]\Big)$$

$$\left(\tanh\left(\frac{z}{2}\right)-\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,2\right]\right)\Bigg)\Bigg)}\Bigg)\Bigg|$$

$$-\Big(\big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,2\right]-\text{Root}\big[$$

$$a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,3\big]\big)$$

$$\big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,1\right]-$$

$$\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,4\right]\big)\Big)\Big/$$

$$\Big(\big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,3\right]-$$

$$\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,1\right]\big)$$

$$\big(\text{Root}\left[a\,\#1^4+2\,b\,\#1^3+2\,a\,\#1^2+4\,c\,\#1^2+2\,b\,\#1+a\,\&,\,2\right]-$$

$$\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 4]))\Big)$$

$$(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 1]+i)+$$

$$\Pi\Big(((\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]+i)$$

$$(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 1]-$$

$$\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 4]))/$$

$$((\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 1]+i)$$

$$(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]-$$

$$\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 4]));$$

$$\sin^{-1}\Big(\sqrt{\Big(\Big((\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]-}$$

$$\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 4])$$

$$\Big(\tanh\Big(\frac{z}{2}\Big)-\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 1]\Big)\Big)\Big/$$

$$\Big((\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 1]-$$

$$\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 4])$$

$$\Big(\tanh\Big(\frac{z}{2}\Big)-\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]\Big)\Big)\Big)\Big) \Big|$$

$$-((\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]-\text{Root}[$$

$$a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 3])$$

$$(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 1]-$$

$$\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 4]))/$$

$$((\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 3]-$$

$$\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 1])$$

$$(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]-$$

$$\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 4]))\Big)$$

$$(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]-\text{Root}[$$

$$a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 1])\Big)\Big)\Big/$$

$$((\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 1]+i)$$

$$(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]+i)$$

$$(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]-$$

$$\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 4]))\Big)$$

$$\sqrt{\frac{a-c+(a+c)\cosh(2 z)+b \sinh(2 z)}{(\cosh(z)+1)^2}} \;\Big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2]-$$

$$\tanh\Big(\frac{z}{2}\Big)\Big)^2$$

$$\sqrt{\Big(\Big((\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 1]-}$$

$$\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 2])$$

$$\Big(\text{Root}[a \#1^4+2 b \#1^3+2 a \#1^2+4 c \#1^2+2 b \#1+a \&, 3]-\tanh\Big(\frac{z}{2}\Big)\Big)\Big)\Big/$$

$$\left(\left(\text{Root}\left[a\,\#1^4 + 2\,b\,\#1^3 + 2\,a\,\#1^2 + 4\,c\,\#1^2 + 2\,b\,\#1 + a\,\&,\,1\right] - \right.\right.$$
$$\left.\text{Root}\left[a\,\#1^4 + 2\,b\,\#1^3 + 2\,a\,\#1^2 + 4\,c\,\#1^2 + 2\,b\,\#1 + a\,\&,\,3\right]\right)$$
$$\left.\left(\text{Root}\left[a\,\#1^4 + 2\,b\,\#1^3 + 2\,a\,\#1^2 + 4\,c\,\#1^2 + 2\,b\,\#1 + a\,\&,\,2\right] - \tanh\left(\frac{z}{2}\right)\right)\right)\Big)$$
$$\sqrt{\left(\left(\left(\text{Root}\left[a\,\#1^4 + 2\,b\,\#1^3 + 2\,a\,\#1^2 + 4\,c\,\#1^2 + 2\,b\,\#1 + a\,\&,\,1\right] - \right.\right.\right.}$$
$$\left.\text{Root}\left[a\,\#1^4 + 2\,b\,\#1^3 + 2\,a\,\#1^2 + 4\,c\,\#1^2 + 2\,b\,\#1 + a\,\&,\,2\right]\right)$$
$$\left.\left(\text{Root}\left[a\,\#1^4 + 2\,b\,\#1^3 + 2\,a\,\#1^2 + 4\,c\,\#1^2 + 2\,b\,\#1 + a\,\&,\,4\right] - \tanh\left(\frac{z}{2}\right)\right)\right)\Big/$$
$$\left(\left(\text{Root}\left[a\,\#1^4 + 2\,b\,\#1^3 + 2\,a\,\#1^2 + 4\,c\,\#1^2 + 2\,b\,\#1 + a\,\&,\,1\right] - \right.\right.$$
$$\left.\text{Root}\left[a\,\#1^4 + 2\,b\,\#1^3 + 2\,a\,\#1^2 + 4\,c\,\#1^2 + 2\,b\,\#1 + a\,\&,\,4\right]\right)$$
$$\left.\left(\text{Root}\left[a\,\#1^4 + 2\,b\,\#1^3 + 2\,a\,\#1^2 + 4\,c\,\#1^2 + 2\,b\,\#1 + a\,\&,\,2\right] - \tanh\left(\frac{z}{2}\right)\right)\right)\Big)$$
$$\sqrt{\left(\left(\left(\text{Root}\left[a\,\#1^4 + 2\,b\,\#1^3 + 2\,a\,\#1^2 + 4\,c\,\#1^2 + 2\,b\,\#1 + a\,\&,\,2\right] - \right.\right.\right.}$$
$$\left.\text{Root}\left[a\,\#1^4 + 2\,b\,\#1^3 + 2\,a\,\#1^2 + 4\,c\,\#1^2 + 2\,b\,\#1 + a\,\&,\,4\right]\right)$$
$$\left.\left(\tanh\left(\frac{z}{2}\right) - \text{Root}\left[a\,\#1^4 + 2\,b\,\#1^3 + 2\,a\,\#1^2 + 4\,c\,\#1^2 + 2\,b\,\#1 + a\,\&,\,1\right]\right)\right)\Big/$$
$$\left(\left(\text{Root}\left[a\,\#1^4 + 2\,b\,\#1^3 + 2\,a\,\#1^2 + 4\,c\,\#1^2 + 2\,b\,\#1 + a\,\&,\,1\right] - \right.\right.$$
$$\left.\text{Root}\left[a\,\#1^4 + 2\,b\,\#1^3 + 2\,a\,\#1^2 + 4\,c\,\#1^2 + 2\,b\,\#1 + a\,\&,\,4\right]\right)$$
$$\left.\left.\left(\tanh\left(\frac{z}{2}\right) - \text{Root}\left[a\,\#1^4 + 2\,b\,\#1^3 + 2\,a\,\#1^2 + 4\,c\,\#1^2 + 2\,b\,\#1 + a\,\&,\,2\right]\right)\right)\right)\Bigg)\Big/$$
$$\left(\left(\text{Root}\left[a\,\#1^4 + 2\,b\,\#1^3 + 2\,a\,\#1^2 + 4\,c\,\#1^2 + 2\,b\,\#1 + a\,\&,\,2\right] - \text{Root}\left[\right.\right.\right.$$
$$\left.\left. a\,\#1^4 + 2\,b\,\#1^3 + 2\,a\,\#1^2 + 4\,c\,\#1^2 + 2\,b\,\#1 + a\,\&,\; 1\right]\right)$$
$$\sqrt{a - c + (a + c)\cosh(2\,z) + b\sinh(2\,z)}$$
$$\left.\sqrt{\operatorname{sech}^4\left(\frac{z}{2}\right)(a - c + (a + c)\cosh(2\,z) + b\sinh(2\,z))}\right)$$

## Involving rational functions of sinh and tanh

01.24.21.0146.01

$$\int \frac{A + B\tanh(z) + C\operatorname{sech}(z)}{a + b\sinh(z)}\,dz =$$
$$-\frac{1}{\left(-a^2 - b^2\right)^{3/2}}\left(2\,A\left(a^2 + b^2\right)\tan^{-1}\left(\frac{b - a\tanh\left(\frac{z}{2}\right)}{\sqrt{-a^2 - b^2}}\right) + 2\sqrt{-a^2 - b^2}\,(b\,B + a\,C)\tan^{-1}\left(\tanh\left(\frac{z}{2}\right)\right) + \right.$$
$$\left.\sqrt{-a^2 - b^2}\,(a\,B - b\,C)\,(\log(\cosh(z)) - \log(a + b\sinh(z)))\right)$$

## Involving algebraic functions of cosh and tanh

01.24.21.0147.01

$$\int \tanh(z)\,(\cosh(z)+\operatorname{sech}(z))\,dz = \sinh(z)\tanh(z)$$

01.24.21.0148.01

$$\int \frac{A + C\operatorname{sech}(z) + B\tanh(z)}{a + b\cosh(z)}\,dz = \frac{1}{a\sqrt{b^2-a^2}} \left((2\,b\,C - 2\,a\,A)\tan^{-1}\left(\frac{(a-b)\tanh\left(\frac{z}{2}\right)}{\sqrt{b^2-a^2}}\right) + 2\sqrt{b^2-a^2}\;C\tan^{-1}\left(\tanh\left(\frac{z}{2}\right)\right) + \sqrt{b^2-a^2}\;B\,(\log(\cosh(z)) - \log(a + b\cosh(z)))\right)$$

01.24.21.0149.01

$$\int \sqrt{a + b\cosh(2\,c\,z)}\;\tanh(c\,z)\operatorname{sech}(c\,z)\,dz = \frac{\sqrt{2}\,\sqrt{b}\,\log\left(\sqrt{2}\,\sqrt{b}\,\cosh(c\,z) + \sqrt{a + b\cosh(2\,c\,z)}\right) - \sqrt{a + b\cosh(2\,c\,z)}\;\operatorname{sech}(c\,z)}{c}$$

01.24.21.0150.01

$$\int \sqrt{a + b\cosh(2\,c\,z)}\;\tanh^2(c\,z)\operatorname{sech}(c\,z)\,dz = \frac{1}{2\sqrt{a-b}\;c}\left((a - 3\,b)\tan^{-1}\left(\frac{\sqrt{a-b}\;\sinh(c\,z)}{\sqrt{a + b\cosh(2\,c\,z)}}\right) + 2\sqrt{2}\,\sqrt{a-b}\,\sqrt{b}\,\tanh^{-1}\left(\frac{\sqrt{2}\,\sqrt{b}\,\sinh(c\,z)}{\sqrt{a + b\cosh(2\,c\,z)}}\right) - \sqrt{a-b}\,\sqrt{a + b\cosh(2\,c\,z)}\;\operatorname{sech}(c\,z)\tanh(c\,z)\right)$$

01.24.21.0151.01

$$\int \frac{\tanh(c\,z)\operatorname{sech}(c\,z)}{\sqrt{a + b\cosh(2\,c\,z)}}\,dz = \frac{\sqrt{a + b\cosh(2\,c\,z)}\;\operatorname{sech}(c\,z)}{b\,c - a\,c}$$

01.24.21.0152.01

$$\int \frac{\tanh^2(c\,z)\operatorname{sech}(c\,z)}{\sqrt{a + b\cosh(2\,c\,z)}}\,dz = \frac{(a+b)\tan^{-1}\left(\frac{\sqrt{a-b}\;\sinh(c\,z)}{\sqrt{a+b\cosh(2\,c\,z)}}\right) - \sqrt{a-b}\,\sqrt{a + b\cosh(2\,c\,z)}\;\operatorname{sech}(c\,z)\tanh(c\,z)}{2\,(a-b)^{3/2}\,c}$$

01.24.21.0153.01

$$\int \frac{\tanh^3(c\,z)\operatorname{sech}(c\,z)}{\sqrt{a + b\cosh(2\,c\,z)}}\,dz = -\frac{\sqrt{a + b\cosh(2\,c\,z)}\;(a + 3\,b + (3\,a + b)\cosh(2\,c\,z))\operatorname{sech}^3(c\,z)}{6\,(a-b)^2\,c}$$

## Involving cosh and coth

01.24.21.0154.01

$$\int \cosh(z)\coth(z)\operatorname{sech}(3\,z)\,dz = \log(\sinh(z)) - \frac{1}{2}\log(2\cosh(2\,z) - 1)$$

## Involving algebraic functions of cosh and csch

01.24.21.0155.01

$$\int \sqrt{a(\cosh(c z)-1)}\,\operatorname{csch}^2\left(\frac{c z}{2}\right)\operatorname{sech}(c z)\,dz = \frac{1}{c}\left(2\sqrt{a(\cosh(c z)-1)}\,\operatorname{csch}\left(\frac{c z}{2}\right)\left(i\sqrt{2}\,\tan^{-1}\left(-\tanh\left(\frac{c z}{4}\right)-i\sqrt{2}\right)+\sqrt{2}\,\tanh^{-1}\left(i\tanh\left(\frac{c z}{4}\right)+\sqrt{2}\right)-\log\left(\cosh\left(\frac{c z}{4}\right)\right)+\log\left(\sinh\left(\frac{c z}{4}\right)\right)\right)\right)$$

01.24.21.0156.01

$$\int \sqrt{a+b\cosh(2 c z)}\,\operatorname{csch}(c z)\operatorname{sech}(c z)\,dz = \frac{\sqrt{a-b}\,\tanh^{-1}\left(\frac{\sqrt{a+b\cosh(2 c z)}}{\sqrt{a-b}}\right)-\sqrt{a+b}\,\tanh^{-1}\left(\frac{\sqrt{a+b\cosh(2 c z)}}{\sqrt{a+b}}\right)}{c}$$

01.24.21.0157.01

$$\int \sqrt{a+b\cosh(2 c z)}\,\operatorname{csch}^2(c z)\operatorname{sech}(c z)\,dz = -\frac{\sqrt{a-b}\,\tan^{-1}\left(\frac{\sqrt{a-b}\,\sinh(c z)}{\sqrt{a+b\cosh(2 c z)}}\right)+\sqrt{a+b\cosh(2 c z)}\,\operatorname{csch}(c z)}{c}$$

01.24.21.0158.01

$$\int \sqrt{a+b\cosh(2 c z)}\,\operatorname{csch}^3(c z)\operatorname{sech}(c z)\,dz = \frac{1}{2\sqrt{a-b}\,\sqrt{a+b}\,c}\left(\sqrt{a-b}\left(2 a\tanh^{-1}\left(\frac{\sqrt{a+b\cosh(2 c z)}}{\sqrt{a+b}}\right)-\sqrt{a+b}\,\sqrt{a+b\cosh(2 c z)}\,\operatorname{csch}^2(c z)\right)-2(a-b)\sqrt{a+b}\,\tanh^{-1}\left(\frac{\sqrt{a+b\cosh(2 c z)}}{\sqrt{a-b}}\right)\right)$$

01.24.21.0159.01

$$\int \sqrt{a+b\cosh(2 c z)}\,\operatorname{csch}^4(c z)\operatorname{sech}(c z)\,dz = \frac{\sqrt{a-b}\,\tan^{-1}\left(\frac{\sqrt{a-b}\,\sinh(c z)}{\sqrt{a+b\cosh(2 c z)}}\right)+\frac{1}{3}\sqrt{a+b\cosh(2 c z)}\,\operatorname{csch}(c z)\left(\frac{3a+b}{a+b}-\operatorname{csch}^2(c z)\right)}{c}$$

01.24.21.0160.01

$$\int \frac{\operatorname{csch}(c z)\operatorname{sech}(c z)}{\sqrt{a+b\cosh(2 c z)}}\,dz = \frac{\frac{\tanh^{-1}\left(\frac{\sqrt{a+b\cosh(2 c z)}}{\sqrt{a-b}}\right)}{\sqrt{a-b}}-\frac{\tanh^{-1}\left(\frac{\sqrt{a+b\cosh(2 c z)}}{\sqrt{a+b}}\right)}{\sqrt{a+b}}}{c}$$

01.24.21.0161.01

$$\int \frac{\operatorname{csch}^2(c z)\operatorname{sech}(c z)}{\sqrt{a+b\cosh(2 c z)}}\,dz = -\frac{\frac{\tan^{-1}\left(\frac{\sqrt{a-b}\,\sinh(c z)}{\sqrt{a+b\cosh(2 c z)}}\right)}{\sqrt{a-b}}+\frac{\sqrt{a+b\cosh(2 c z)}\,\operatorname{csch}(c z)}{a+b}}{c}$$

01.24.21.0162.01

$$\int \frac{\operatorname{csch}^3(c z)\operatorname{sech}(c z)}{\sqrt{a+b\cosh(2 c z)}}\,dz = \frac{1}{2\sqrt{a-b}\,(a+b)^{3/2}c}\left(\sqrt{a-b}\left(2(a+2b)\tanh^{-1}\left(\frac{\sqrt{a+b\cosh(2 c z)}}{\sqrt{a+b}}\right)-\sqrt{a+b}\,\sqrt{a+b\cosh(2 c z)}\,\operatorname{csch}^2(c z)\right)-2(a+b)^{3/2}\tanh^{-1}\left(\frac{\sqrt{a+b\cosh(2 c z)}}{\sqrt{a-b}}\right)\right)$$

01.24.21.0163.01

$$\int \frac{\operatorname{csch}^4(c z)\operatorname{sech}(c z)}{\sqrt{a+b\cosh(2 c z)}}\,dz = \frac{1}{c}\left(\frac{\sqrt{a+b\cosh(2 c z)}\,(-5a-9b+(3a+7b)\cosh(2 c z))\operatorname{csch}^3(c z)}{6(a+b)^2}+\frac{1}{\sqrt{a-b}}\tan^{-1}\left(\frac{\sqrt{a-b}\,\sinh(c z)}{\sqrt{a+b\cosh(2 c z)}}\right)\right)$$

## Involving hyperbolic and a power functions

### Involving sinh and power

## Involving $z^n \sinh(a + b z)$

01.24.21.0164.01

$$\int z^n \sinh(a+b z)\operatorname{sech}(c z)\,dz = -e^{(-b+c)z-a}\, n! \sum_{j=0}^{n} \frac{(-1)^j (-b+c)^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{-b+c}{2c}, \ldots, \frac{-b+c}{2c}, 1; \frac{-b+c}{2c}+1, \ldots, \frac{-b+c}{2c}+1; -e^{2 c z}\right) + e^{a+(b+c)z}\, n! \sum_{j=0}^{n} \frac{(-1)^j (b+c)^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{b+c}{2c}, \ldots, \frac{b+c}{2c}, 1; \frac{b+c}{2c}+1, \ldots, \frac{b+c}{2c}+1; -e^{2 c z}\right) /; n \in \mathbb{N}$$

01.24.21.0165.01

$$\int z^n \sinh(b z)\operatorname{sech}(c z)\,dz = n!\left(e^{(c+b)z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j}}{(n-j)!\,(c+b)^{j+1}}\, {}_{j+2}F_{j+1}\left(\frac{c+b}{2c}, \ldots, \frac{c+b}{2c}, 1; \frac{3c+b}{2c}, \ldots, \frac{3c+b}{2c}; -e^{2 c z}\right) - e^{(c-b)z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j}}{(n-j)!\,(c-b)^{j+1}}\, {}_{j+2}F_{j+1}\left(\frac{c-b}{2c}, \ldots, \frac{c-b}{2c}, 1; \frac{3c-b}{2c}, \ldots, \frac{3c-b}{2c}; -e^{2 c z}\right)\right) /; n \in \mathbb{N}^+$$

01.24.21.0166.01

$$\int z^n \sinh(c z)\operatorname{sech}(c z)\,dz = 2 e^{2 c z}\, n! \sum_{j=0}^{n} \frac{\left((-1)^j (2c)^{-j-1} z^{n-j}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\left(1, \ldots, 1; 2, \ldots, 2; -e^{2 c z}\right) - \frac{z^{n+1}}{n+1} /; n \in \mathbb{N}$$

### Involving power of sinh and power

## Involving $z^n \sinh^m(b z)$

01.24.21.0167.01

$$\int z^n \sinh^m(b z) \operatorname{sech}(c z)\, dz = 2^{1-m} i^{-m} \binom{m}{\frac{m}{2}} (1 - m \bmod 2)\, n!\, e^{c z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j}\right)}{(n-j)!\, c^{j+1}} \, {}_{j+2}F_{j+1}\left(\frac{1}{2}, \ldots, \frac{1}{2}, 1; \frac{3}{2}, \ldots, \frac{3}{2}; -e^{2 c z}\right) + 2^{1-m} n! \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left((-1)^m e^{(c-b(m-2k)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j}\right)}{(n-j)!\, (c-b(m-2k))^{j+1}} \, {}_{j+2}F_{j+1}\left(\frac{c-b(m-2k)}{2c}, \ldots, \frac{c-b(m-2k)}{2c}, 1; \frac{c-b(m-2k)}{2c}+1, \ldots, \frac{c-b(m-2k)}{2c}+1; -e^{2 c z}\right) + e^{(c+b(m-2k)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j}\right)}{(n-j)!\, (c+b(m-2k))^{j+1}} \, {}_{j+2}F_{j+1}\left(\frac{c+b(m-2k)}{2c}, \ldots, \frac{c+b(m-2k)}{2c}, 1; \frac{c+b(m-2k)}{2c}+1, \ldots, \frac{c+b(m-2k)}{2c}+1; -e^{2 c z}\right)\right) /; n \in \mathbb{N}^+ \land m \in \mathbb{N}^+$$

Involving cosh and power

## Involving $z^n \cosh(a + b z)$

01.24.21.0168.01

$$\int z^n \cosh(a + b z) \operatorname{sech}(c z)\, dz = e^{(-b+c) z - a}\, n! \sum_{j=0}^{n} \frac{(-1)^j (-b+c)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{-b+c}{2c}, \ldots, \frac{-b+c}{2c}, 1; \frac{-b+c}{2c}+1, \ldots, \frac{-b+c}{2c}+1; -e^{2 c z}\right) + e^{a+(b+c) z}\, n! \sum_{j=0}^{n} \frac{(-1)^j (b+c)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{b+c}{2c}, \ldots, \frac{b+c}{2c}, 1; \frac{b+c}{2c}+1, \ldots, \frac{b+c}{2c}+1; -e^{2 c z}\right) /; n \in \mathbb{N}$$

01.24.21.0169.01

$$\int z^n \cosh(b z) \operatorname{sech}(c z)\, dz = n! \left(e^{(c+b) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j}}{(n-j)!\, (c+b)^{j+1}} \, {}_{j+2}F_{j+1}\left(\frac{c+b}{2c}, \ldots, \frac{c+b}{2c}, 1; \frac{3c+b}{2c}, \ldots, \frac{3c+b}{2c}; -e^{2 c z}\right) + e^{(c-b) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j}}{(n-j)!\, (c-b)^{j+1}} \, {}_{j+2}F_{j+1}\left(\frac{c-b}{2c}, \ldots, \frac{c-b}{2c}, 1; \frac{3c-b}{2c}, \ldots, \frac{3c-b}{2c}; -e^{2 c z}\right)\right) /; n \in \mathbb{N}^+$$

Involving power of cosh and power

## Involving $z^n \cosh^m(b z)$

01.24.21.0170.01

$$\int z^n \cosh^m(b z) \operatorname{sech}(c z) \, dz = 2^{1-m} e^{c z} \binom{m}{\frac{m}{2}} n! \, (1 - m \bmod 2) \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j}\right)}{(n-j)! \, c^{j+1}} \, {}_{j+2}F_{j+1}\left(\frac{1}{2}, \ldots, \frac{1}{2}, 1; \frac{3}{2}, \ldots, \frac{3}{2}; -e^{2 c z}\right) + 2^{1-m} n! \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left(e^{(c-b(m-2k))z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j}\right)}{(n-j)! \, (c - b(m-2k))^{j+1}} \, {}_{j+2}F_{j+1}\left(\frac{c-b(m-2k)}{2c}, \ldots, \frac{c-b(m-2k)}{2c}, 1; \frac{c-b(m-2k)}{2c} + 1, \ldots, \frac{c-b(m-2k)}{2c} + 1; -e^{2 c z}\right) + e^{(c+b(m-2k))z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j}\right)}{(n-j)! \, (c + b(m-2k))^{j+1}} \, {}_{j+2}F_{j+1}\left(\frac{c+b(m-2k)}{2c}, \ldots, \frac{c+b(m-2k)}{2c}, 1; \frac{c+b(m-2k)}{2c} + 1, \ldots, \frac{c+b(m-2k)}{2c} + 1; -e^{2 c z}\right)\right) /; n \in \mathbb{N}^+ \land m \in \mathbb{N}^+$$

## Involving tanh and power

### Involving $z^n \tanh(c z)$

01.24.21.0171.01

$$\int z^n \tanh(c z) \operatorname{sech}(c z) \, dz = 2 e^{2 c z} n! \left(e^{c z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (3 c)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{3}{2}, \ldots, \frac{3}{2}, 2; \frac{5}{2}, \ldots, \frac{5}{2}; -e^{2 c z}\right) - e^{-c z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} c^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{1}{2}, \ldots, \frac{1}{2}, 2; \frac{3}{2}, \ldots, \frac{3}{2}; -e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

01.24.21.0172.01

$$\int z \tanh(c z) \operatorname{sech}(c z) \, dz = \frac{2 \tan^{-1}\left(\tanh\left(\frac{c z}{2}\right)\right) - c z \operatorname{sech}(c z)}{c^2}$$

## Involving powers of tanh and power

### Involving $z^n \tanh^u(c z)$

01.24.21.0173.01

$$\int z^n \tanh^u(c z)\operatorname{sech}(c z)\,dz = 2\,i^u\,e^{c(u+1)z}\binom{u}{\frac{u}{2}} n!\,(1-u \bmod 2) \sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(c(u+1))^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{u+1}{2},\ldots,\frac{u+1}{2},u+1;\frac{u+1}{2}+1,\ldots,\frac{u+1}{2}+1;-e^{2cz}\right)+$$

$$2\,n!\,e^{c(u+1)z}\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\left((-1)^u e^{(-c(u-2k))z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(c(2k+1))^{-j-1}\right)}{(n-j)!}\right.$$

$${}_{j+2}F_{j+1}\left(\frac{1}{2}(2k+1),\ldots,\frac{1}{2}(2k+1),u+1;\frac{1}{2}(2k+1)+1,\ldots,\frac{1}{2}(2k+1)+1;-e^{2cz}\right)+$$

$$e^{(c(u-2k))z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(c(-2k+2u+1))^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{1}{2}(-2k+2u+1),\ldots,\frac{1}{2}(-2k+2u+1),\right.$$

$$\left.\left.u+1;\frac{1}{2}(-2k+2u+1)+1,\ldots,\frac{1}{2}(-2k+2u+1)+1;-e^{2cz}\right)\right)\,/;\,n\in\mathbb{N}\land u\in\mathbb{N}^+$$

01.24.21.0174.01

$$\int z\tanh^3(c z)\operatorname{sech}(c z)\,dz = \frac{2\,c\,z\operatorname{sech}^3(c z)-(6\,c\,z+\tanh(c z))\operatorname{sech}(c z)+10\tan^{-1}\left(\tanh\left(\frac{c z}{2}\right)\right)}{6\,c^2}$$

## Involving coth and power

### Involving $z^n \coth(c z)$

01.24.21.0175.01

$$\int z^n\coth(c z)\operatorname{sech}(c z)\,dz = -2\,e^{cz}\,n!\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^j z^{n-j}c^{-j-1}\,{}_{j+2}F_{j+1}\left(\frac{1}{2},\ldots,\frac{1}{2},1;\frac{3}{2},\ldots,\frac{3}{2};e^{2cz}\right)/;\,n\in\mathbb{N}$$

01.24.21.0176.01

$$\int z\coth(c z)\operatorname{sech}(c z)\,dz = \frac{c\,z\left(\log(1-e^{-cz})-\log(1+e^{-cz})\right)+\operatorname{Li}_2(-e^{-cz})-\operatorname{Li}_2(e^{-cz})}{c^2}$$

## Involving powers of coth and power

### Involving $z^n \coth^u(c z)$

01.24.21.0177.01

$$\int z^n \coth^u(c\,z)\,\mathrm{sech}(c\,z)\,dz = 2\,(-1)^u\,e^{c\,u\,z}\binom{u-1}{\frac{u-1}{2}}n!\,(1-(u-1)\bmod 2)\sum_{j=0}^{n}\frac{(-1)^j\,(c\,u)^{-j-1}\,z^{n-j}}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{u}{2},\,\ldots,\,\frac{u}{2},\,u;\,\frac{u}{2}+1,\,\ldots,\,\frac{u}{2}+1;\,e^{2\,c\,z}\right)+ 2\,(-1)^u\,e^{c\,u\,z}\,n!\sum_{k=0}^{\left\lfloor\frac{u-2}{2}\right\rfloor}\binom{u-1}{k}\left(e^{-c\,(-2\,k+u-1)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(c\,(2\,k+1))^{-j-1}\,z^{n-j}}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{1}{2}\,(2\,k+1),\,\ldots,\,\frac{1}{2}\,(2\,k+1),\,u;\,\frac{1}{2}\,(2\,k+1)+1,\,\ldots,\,\frac{1}{2}\,(2\,k+1)+1;\,e^{2\,c\,z}\right)+ e^{c\,(-2\,k+u-1)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(c\,(-2\,k+2\,u-1))^{-j-1}\,z^{n-j}}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{1}{2}\,(-2\,k+2\,u-1),\,\ldots,\,\frac{1}{2}\,(-2\,k+2\,u-1),\,u;\,\frac{1}{2}\,(-2\,k+2\,u-1)+1,\,\ldots,\,\frac{1}{2}\,(-2\,k+2\,u-1)+1;\,e^{2\,c\,z}\right)\right)\;/;\;n\in\mathbb{N}\land u\in\mathbb{N}^+$$

## Involving hyperbolic and exponential functions

### Involving sinh and exp

#### Involving $e^{p\,z}\sinh(b\,z)$

01.24.21.0178.01

$$\int e^{p\,z}\sinh(b\,z)\,\mathrm{sech}(c\,z)\,dz = \frac{e^{(c+b+p)\,z}}{c+b+p}\,{}_2F_1\!\left(1,\,\frac{c+b+p}{2\,c};\,\frac{3\,c+b+p}{2\,c};\,-e^{2\,c\,z}\right)-\frac{e^{(c-b+p)\,z}}{c-b+p}\,{}_2F_1\!\left(1,\,\frac{c-b+p}{2\,c};\,\frac{3\,c-b+p}{2\,c};\,-e^{2\,c\,z}\right)$$

01.24.21.0179.01

$$\int e^{(b-c)\,z}\sinh(b\,z)\,\mathrm{sech}(c\,z)\,dz = -z+\frac{e^{2\,b\,z}}{2\,b}\,{}_2F_1\!\left(1,\,\frac{b}{c};\,\frac{b}{c}+1;\,-e^{2\,c\,z}\right)+\frac{\log\left(1+e^{2\,c\,z}\right)}{2\,c}$$

01.24.21.0180.01

$$\int e^{-(b+c)\,z}\sinh(b\,z)\,\mathrm{sech}(c\,z)\,dz = \frac{1}{2}\left(\frac{e^{-2\,b\,z}}{b}\,{}_2F_1\!\left(-\frac{b}{c},\,1;\,1-\frac{b}{c};\,-e^{2\,c\,z}\right)-\frac{\log\left(1+e^{-2\,c\,z}\right)}{c}\right)$$

### Involving power of sinh and exp

#### Involving $e^{p\,z}\sinh^m(b\,z)$

01.24.21.0181.01

$$\int e^{p z} \sinh^m(b z) \operatorname{sech}(c z) \, dz = 2^{1-m} \left( -\frac{i^{-m} e^{(c+p) z} (m \bmod 2 - 1)}{c+p} \binom{m}{\frac{m}{2}} {}_2F_1\left(1, \frac{c+p}{2 c}; \frac{1}{2}\left(\frac{p}{c}+3\right); -e^{2 c z}\right) + \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left( \frac{e^{(c-2 b k+b m+p) z}}{c-2 b k+b m+p} {}_2F_1\left(1, \frac{c-2 b k+b m+p}{2 c}; \frac{3 c-2 b k+b m+p}{2 c}; -e^{2 c z}\right) + \frac{(-1)^m e^{(c+2 b k-b m+p) z}}{c+2 b k-b m+p} {}_2F_1\left(1, \frac{c+2 b k-b m+p}{2 c}; \frac{3 c+2 b k-b m+p}{2 c}; -e^{2 c z}\right)\right)\right) /; m \in \mathbb{N}^+$$

01.24.21.0182.01

$$\int e^{p z} \sinh^\mu(c z) \operatorname{sech}(c z) \, dz = \frac{2 e^{(p-c) z} \left(1-e^{-2 c z}\right)^{-\mu} \sinh^\mu(c z)}{(\mu-1) c+p} F_1\left(-\frac{\mu c-c+p}{2 c}; 1, -\mu; \frac{c(3-\mu)-p}{2 c}; -e^{-2 c z}, e^{-2 c z}\right)$$

01.24.21.0183.01

$$\int e^{c(1-\mu) z} \sinh^\mu(c z) \operatorname{sech}(c z) \, dz = \frac{e^{c(2-\mu) z} \left(1-e^{2 c z}\right)^{-\mu} \sinh^\mu(c z)}{c(1-\mu)} F_1\left(1-\mu; -\mu, 1; 2-\mu; e^{2 c z}, -e^{2 c z}\right)$$

## Involving cosh and exp

### Involving $e^{p z} \cosh(b z)$

01.24.21.0184.01

$$\int e^{p z} \cosh(b z) \operatorname{sech}(c z) \, dz = \frac{e^{(c-b+p) z}}{c-b+p} {}_2F_1\left(1, \frac{c-b+p}{2 c}; \frac{3 c-b+p}{2 c}; -e^{2 c z}\right) + \frac{e^{(c+b+p) z}}{c+b+p} {}_2F_1\left(1, \frac{c+b+p}{2 c}; \frac{3 c+b+p}{2 c}; -e^{2 c z}\right)$$

01.24.21.0185.01

$$\int e^{(b-c) z} \cosh(b z) \operatorname{sech}(c z) \, dz = z + \frac{e^{2 b z}}{2 b} {}_2F_1\left(1, \frac{b}{c}; \frac{b}{c}+1; -e^{2 c z}\right) - \frac{\log\left(1+e^{2 c z}\right)}{2 c}$$

01.24.21.0186.01

$$\int e^{-(b+c) z} \cosh(b z) \operatorname{sech}(c z) \, dz = z - \frac{e^{-2 b z}}{2 b} {}_2F_1\left(1, -\frac{b}{c}; 1-\frac{b}{c}; -e^{2 c z}\right) - \frac{\log\left(1+e^{2 c z}\right)}{2 c}$$

## Involving power of cosh and exp

### Involving $e^{p z} \cosh^m(b z)$

01.24.21.0187.01

$$\int e^{p z} \cosh^m(b z) \operatorname{sech}(c z) \, dz = 2^{1-m} \left( \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \left( \frac{e^{(c-b m+p+2 b s) z}}{c-b m+p+2 b s} \, {}_2F_1\left(1, \frac{c-b m+p+2 b s}{2 c}; \frac{3 c-b m+p+2 b s}{2 c}; -e^{2 c z}\right) + \frac{e^{(c+b m+p-2 b s) z}}{c+b m+p-2 b s} \, {}_2F_1\left(1, \frac{c+b m+p-2 b s}{2 c}; \frac{3 c+b m+p-2 b s}{2 c}; -e^{2 c z}\right) \right) - \frac{e^{(c+p) z} (m \bmod 2-1)}{c+p} \binom{m}{\frac{m}{2}} \, {}_2F_1\left(1, \frac{c+p}{2 c}; \frac{1}{2}\left(\frac{p}{c}+3\right); -e^{2 c z}\right) \right) /; m \in \mathbb{N}^+$$

01.24.21.0188.01

$$\int e^{p z} \cosh^\mu(c z) \operatorname{sech}(c z) \, dz = \frac{2 e^{(c+p) z} \cosh^\mu(c z) \left(1+e^{2 c z}\right)^{-\mu}}{-\mu c+c+p} \, {}_2F_1\left(\frac{-\mu c+c+p}{2 c}, 1-\mu; \frac{-\mu c+3 c+p}{2 c}; -e^{2 c z}\right)$$

01.24.21.0189.01

$$\int e^{c (\mu-1) z} \cosh^\mu(c z) \operatorname{sech}(c z) \, dz = \frac{e^{c z (\mu-2)} \left(1+e^{-2 c z}\right)^{-\mu} \cosh^\mu(c z)}{c (\mu-1)} \, {}_2F_1\left(1-\mu, 1-\mu; 2-\mu; -e^{-2 c z}\right)$$

## Involving tanh and exp

### Involving $e^{p z} \tanh(c z)$

01.24.21.0190.01

$$\int e^{p z} \tanh(c z) \operatorname{sech}(c z) \, dz = 2 e^{(p-3 c) z} \left( \frac{4 c e^{-2 c z} \left(-1+e^{2 c z}\right) {}_2F_1\left(3, \frac{3}{2}-\frac{p}{2 c}; \frac{7}{2}-\frac{p}{2 c}; -e^{-2 c z}\right)}{(3 c-p) (5 c-p)} - \frac{\left(c \left(-1+3 e^{2 c z}\right)-e^{2 c z} p+p\right) {}_2F_1\left(2, \frac{1}{2}-\frac{p}{2 c}; \frac{5}{2}-\frac{p}{2 c}; -e^{-2 c z}\right)}{(p-3 c) (p-c)} \right)$$

## Involving powers of tanh and exp

### Involving $e^{p z} \tanh^\mu(c z)$

01.24.21.0191.01

$$\int e^{p z} \tanh^\mu(c z) \operatorname{sech}(c z) \, dz = \frac{2 e^{(p-c) z} \left(1-e^{-2 c z}\right)^{-\mu} \left(1+e^{-2 c z}\right)^\mu \tanh^\mu(c z)}{p-c} F_1\left(-\frac{p-c}{2 c}; \mu+1, -\mu; \frac{1}{2}\left(3-\frac{p}{c}\right); -e^{-2 c z}, e^{-2 c z}\right)$$

01.24.21.0192.01

$$\int e^{c z} \tanh^\mu(c z) \operatorname{sech}(c z) \, dz = -\frac{2^\mu \left(1-e^{2 c z}\right)^{-\mu} \tanh^\mu(c z)}{c \mu} \, {}_2F_1\left(-\mu, -\mu; 1-\mu; \frac{1}{2}\left(1+e^{2 c z}\right)\right)$$

## Involving coth and exp

## Involving $e^{p z}\coth(c z)$

01.24.21.0193.01

$$\int e^{p z}\coth(c z)\operatorname{sech}(c z)\,dz = -\frac{2\,e^{(p-c)z}}{c-p}\,{}_2F_1\left(\frac{c-p}{2c},1;\frac{1}{2}\left(3-\frac{p}{c}\right);e^{-2cz}\right)$$

01.24.21.0194.01

$$\int e^{c z}\coth(c z)\operatorname{sech}(c z)\,dz = \frac{\log\left(-1+e^{2cz}\right)}{c}$$

### Involving powers of coth and exp

## Involving $e^{p z}\coth^{\mu}(c z)$

01.24.21.0195.01

$$\int e^{p z}\coth^{\mu}(c z)\operatorname{sech}(c z)\,dz = \frac{2\,e^{(p-c)z}\left(1-e^{-2cz}\right)^{\mu}\left(1+e^{-2cz}\right)^{-\mu}\coth^{\mu}(c z)}{p-c}\,F_1\left(\frac{c-p}{2c};1-\mu,\mu;\frac{1}{2}\left(3-\frac{p}{c}\right);-e^{-2cz},e^{-2cz}\right)$$

01.24.21.0196.01

$$\int e^{c z}\coth^{\mu}(c z)\operatorname{sech}(c z)\,dz = \frac{2^{-\mu}\left(1-e^{2cz}\right)^{\mu}\coth^{\mu}(c z)}{c\,\mu}\,{}_2F_1\left(\mu,\mu;\mu+1;\frac{1}{2}\left(1+e^{2cz}\right)\right)$$

### Involving csch and exp

## Involving $e^{p z}\operatorname{csch}(c z)$

01.24.21.0197.01

$$\int e^{p z}\operatorname{csch}(c z)\operatorname{sech}(c z)\,dz = \frac{1}{p\,(2c+p)}\left(e^{p z}\left((2c+p)\,{}_2F_1\left(\frac{p}{2c},1;\frac{p}{2c}+1;-e^{2cz}\right)-(2c+p)\,{}_2F_1\left(\frac{p}{2c},1;\frac{p}{2c}+1;e^{2cz}\right)-e^{2cz}\right.\right.$$
$$\left.\left.p\left({}_2F_1\left(\frac{p}{2c}+1,1;\frac{p}{2c}+2;-e^{2cz}\right)+{}_2F_1\left(\frac{p}{2c}+1,1;\frac{p}{2c}+2;e^{2cz}\right)\right)\right)\right)$$

01.24.21.0198.01

$$\int e^{2c z}\operatorname{csch}(c z)\operatorname{sech}(c z)\,dz = \frac{\log\left(-1+e^{2cz}\right)+\log\left(1+e^{2cz}\right)}{c}$$

### Involving powers of csch and exp

## Involving $e^{p z}\operatorname{csch}^{\mu}(c z)$

01.24.21.0199.01

$$\int e^{p z}\operatorname{csch}^{\mu}(c z)\operatorname{sech}(c z)\,dz = \frac{2\,e^{(p-c)z}\left(1-e^{-2cz}\right)^{\mu}\operatorname{csch}^{\mu}(c z)}{p-c\,(\mu+1)}\,F_1\left(\frac{\mu c+c-p}{2c};1,\mu;\frac{c\,(\mu+3)-p}{2c};-e^{-2cz},e^{-2cz}\right)$$

01.24.21.0200.01

$$\int e^{c(\mu+1)z} \operatorname{csch}^{\mu}(c z) \operatorname{sech}(c z) \, dz = \frac{e^{c(\mu+2)z} \left(1 - e^{2 c z}\right)^{\mu} \operatorname{csch}^{\mu}(c z)}{c(\mu+1)} F_1\left(\mu+1; \mu, 1; \mu+2; e^{2 c z}, -e^{2 c z}\right)$$

## Involving hyperbolic and trigonometric functions

### Involving sin and sinh

#### Involving $\sin(a z) \sinh(b z) \operatorname{sech}(c z)$

01.24.21.0201.01

$$\int \sin(a z) \sinh(b z) \operatorname{sech}(c z) \, dz = -\frac{1}{2} i \left( \frac{e^{(-b+c+i a) z} {}_2F_1\left(1, \frac{-b+c+i a}{2 c}; \frac{-b+3 c+i a}{2 c}; -e^{2 c z}\right)}{b-c-i a} + \frac{e^{(b+c+i a) z} {}_2F_1\left(1, \frac{b+c+i a}{2 c}; \frac{b+3 c+i a}{2 c}; -e^{2 c z}\right)}{b+c+i a} + \frac{e^{(-b+c-i a) z} {}_2F_1\left(1, -\frac{b-c+i a}{2 c}; -\frac{b-3 c+i a}{2 c}; -e^{2 c z}\right)}{-b+c-i a} - \frac{e^{(b+c-i a) z} {}_2F_1\left(1, \frac{b+c-i a}{2 c}; \frac{b+3 c-i a}{2 c}; -e^{2 c z}\right)}{b+c-i a} \right)$$

### Involving powers of sin and powers of sinh

#### Involving $\sin^m(a z) \sinh^u(b z) \operatorname{sech}(c z)$

01.24.21.0202.01

$$\int \sin^m(a z)\sinh^u(b z)\operatorname{sech}(c z)\,dz = \frac{i^u\,2^{-m-u+1}\tan^{-1}\left(\tanh\left(\frac{c z}{2}\right)\right)(1-m \bmod 2)(1-u \bmod 2)}{c}\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}} +$$
$$i^u\,2^{-m-u+1}\binom{u}{\frac{u}{2}}(1-u \bmod 2)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(\frac{e^{(c+a i (m-2k))z-\frac{i m\pi}{2}}\,{}_2F_1\left(1,\frac{c-2 i a k+i a m}{2c};\frac{3c-2 i a k+i a m}{2c};-e^{2cz}\right)}{c+a i (m-2k)}+\right.$$
$$\left.\frac{e^{\frac{i\pi m}{2}+(c+2 i a k-i a m)z}\,{}_2F_1\left(1,\frac{c+2 i a k-i a m}{2c};\frac{3c+2 i a k-i a m}{2c};-e^{2cz}\right)}{c+2 i a k-i a m}\right)+$$
$$2^{-m-u+1}\binom{m}{\frac{m}{2}}(1-m \bmod 2)\sum_{j=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^j\binom{u}{j}\left(\frac{e^{(c-2bj+bu)z}\,{}_2F_1\left(1,\frac{c-2bj+bu}{2c};\frac{3c-2bj+bu}{2c};-e^{2cz}\right)}{c+b(u-2j)}+\right.$$
$$\left.\frac{(-1)^u e^{(c+2bj-bu)z}\,{}_2F_1\left(1,\frac{c+2bj-bu}{2c};\frac{3c+2bj-bu}{2c};-e^{2cz}\right)}{c+2bj-bu}\right)+2^{-m-u+1}\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\sum_{j=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^j\binom{u}{j}$$
$$\left(\left(e^{(c-2bj-2iak+iam+bu)z-\frac{i\pi m}{2}}\,{}_2F_1\left(1,\frac{c-2bj-2iak+iam+bu}{2c};\frac{3c-2bj-2iak+iam+bu}{2c};-e^{2cz}\right)\right)\right/$$
$$(c-2bj-2iak+iam+bu)+\left(e^{\frac{i\pi m}{2}+(c-2bj+2iak-iam+bu)z}\right.$$
$$\left.{}_2F_1\left(1,\frac{c-2bj+2iak-iam+bu}{2c};\frac{3c-2bj+2iak-iam+bu}{2c};-e^{2cz}\right)\right)\Big/$$
$$(c-2bj+2iak-iam+bu)+\left((-1)^u e^{(c+2bj-2iak+iam-bu)z-\frac{i\pi m}{2}}\,{}_2F_1\left(1,\frac{c+2bj-2iak+iam-bu}{2c};\right.\right.$$
$$\left.\left.\frac{3c+2bj-2iak+iam-bu}{2c};-e^{2cz}\right)\right)\Big/(c+2bj-2iak+iam-bu)+$$
$$\left((-1)^u e^{\frac{i\pi m}{2}+(c+2bj+2iak-iam-bu)z}\,{}_2F_1\left(1,\frac{c+2bj+2iak-iam-bu}{2c};\frac{3c+2bj+2iak-iam-bu}{2c};\right.\right.$$
$$\left.\left.\left.-e^{2cz}\right)\right)\Big/(c+2bj+2iak-iam-bu)\right)\,/;\,m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

## Involving cos and sinh

### Involving $\cos(a z)\sinh(b z)\operatorname{sech}(c z)$

01.24.21.0203.01

$$\int \cos(a\,z)\sinh(b\,z)\operatorname{sech}(c\,z)\,dz = \frac{1}{2}\left(\frac{e^{i\pi+(-b+c-i a)z}\,{}_2F_1\left(1,\frac{-b+c-i a}{2c};\frac{-b+3c-i a}{2c};-e^{2cz}\right)}{-b+c-i a}+\frac{e^{i\pi+(-b+c+i a)z}\,{}_2F_1\left(1,\frac{-b+c+i a}{2c};\frac{-b+3c+i a}{2c};-e^{2cz}\right)}{-b+c+i a}+\frac{e^{(b+c-i a)z}\,{}_2F_1\left(1,\frac{b+c-i a}{2c};\frac{b+3c-i a}{2c};-e^{2cz}\right)}{b+c-i a}+\frac{e^{(b+c+i a)z}\,{}_2F_1\left(1,\frac{b+c+i a}{2c};\frac{b+3c+i a}{2c};-e^{2cz}\right)}{b+c+i a}\right)$$

## Involving powers of cos and powers of sinh

### Involving $\cos^m(a\,z)\sinh^u(b\,z)\operatorname{sech}(c\,z)$

01.24.21.0204.01

$$\int \cos^m(a\,z)\sinh^u(b\,z)\operatorname{sech}(c\,z)\,dz = \frac{i^u\,2^{-m-u+1}\tan^{-1}(e^{cz})(1-m\bmod 2)(1-u\bmod 2)}{c}\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}+$$
$$i^u\,2^{-m-u+1}\binom{u}{\frac{u}{2}}(1-u\bmod 2)\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(\frac{e^{(c-i a m+2 i a s)z}\,{}_2F_1\left(1,\frac{c-i a m+2 i a s}{2c};\frac{3c-i a m+2 i a s}{2c};-e^{2cz}\right)}{c-i a m+2 i a s}+\frac{e^{(c+i a m-2 i a s)z}\,{}_2F_1\left(1,\frac{c+i a m-2 i a s}{2c};\frac{3c+i a m-2 i a s}{2c};-e^{2cz}\right)}{c+i a m-2 i a s}\right)+$$
$$2^{-m-u+1}\binom{m}{\frac{m}{2}}(1-m\bmod 2)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\left(\frac{e^{(c-2bk+bu)z}\,{}_2F_1\left(1,\frac{c-2bk+bu}{2c};\frac{3c-2bk+bu}{2c};-e^{2cz}\right)}{c-2bk+bu}+\frac{(-1)^u e^{(c+2bk-bu)z}\,{}_2F_1\left(1,\frac{c+2bk-bu}{2c};\frac{3c+2bk-bu}{2c};-e^{2cz}\right)}{c+2bk-bu}\right)+2^{-m-u+1}\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}$$
$$\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(\left(e^{(c-2bk-i a m+2 i a s+bu)z}\,{}_2F_1\left(1,\frac{c-2bk-i a m+2 i a s+bu}{2c};\frac{3c-2bk-i a m+2 i a s+bu}{2c};-e^{2cz}\right)\right)\Big/(c-2bk-i a m+2 i a s+bu)+\left(e^{(c-2bk+i a m-2 i a s+bu)z}\,{}_2F_1\left(1,\frac{c-2bk+i a m-2 i a s+bu}{2c};\frac{3c-2bk+i a m-2 i a s+bu}{2c};-e^{2cz}\right)\right)\Big/(c-2bk+i a m-2 i a s+bu)+\left(e^{i\pi u+(c+2bk-i a m+2 i a s-bu)z}\,{}_2F_1\left(1,\frac{c+2bk-i a m+2 i a s-bu}{2c};\frac{3c+2bk-i a m+2 i a s-bu}{2c};-e^{2cz}\right)\right)\Big/(c+2bk-i a m+2 i a s-bu)+\left(e^{i\pi u+(c+2bk+i a m-2 i a s-bu)z}\,{}_2F_1\left(1,\frac{c+2bk+i a m-2 i a s-bu}{2c};\frac{3c+2bk+i a m-2 i a s-bu}{2c};-e^{2cz}\right)\right)\Big/(c+2bk+i a m-2 i a s-bu)\right)\;/;\;m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

## Involving sin and cosh

### Involving sin(a z) cosh(b z) sech(c z)

01.24.21.0205.01

$$\int \sin(a\,z)\cosh(b\,z)\operatorname{sech}(c\,z)\,dz = -\frac{1}{2}\,i\left(\frac{e^{i\pi+(-b+c-i\,a)z}\,{}_2F_1\left(1,\frac{-b+c-i\,a}{2c};\frac{-b+3c-i\,a}{2c};-e^{2cz}\right)}{-b+c-i\,a}+\frac{e^{(-b+c+i\,a)z}\,{}_2F_1\left(1,\frac{-b+c+i\,a}{2c};\frac{-b+3c+i\,a}{2c};-e^{2cz}\right)}{-b+c+i\,a}+\frac{e^{i\pi+(b+c-i\,a)z}\,{}_2F_1\left(1,\frac{b+c-i\,a}{2c};\frac{b+3c-i\,a}{2c};-e^{2cz}\right)}{b+c-i\,a}+\frac{e^{(b+c+i\,a)z}\,{}_2F_1\left(1,\frac{b+c+i\,a}{2c};\frac{b+3c+i\,a}{2c};-e^{2cz}\right)}{b+c+i\,a}\right)$$

## Involving powers of sin and powers of cosh

### Involving $\sin^m(a\,z)\cosh^u(b\,z)\operatorname{sech}(c\,z)$

01.24.21.0206.01

$$\int \sin^m(a z)\cosh^u(b z)\operatorname{sech}(c z)\,dz = \frac{2^{-m-u+1}\tan^{-1}(e^{c z})\,(1-m \bmod 2)(1-u \bmod 2)}{c}\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}} + 2^{-m-u+1}\binom{u}{\frac{u}{2}}(1-u \bmod 2)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(\frac{e^{(c-2 i a k+i a m) z-\frac{i m \pi}{2}}\,{}_2F_1\left(1,\frac{c-2 i a k+i a m}{2 c};\frac{3 c-2 i a k+i a m}{2 c};-e^{2 c z}\right)}{c-2 i a k+i a m} + \frac{e^{\frac{i \pi m}{2}+(c+2 i a k-i a m) z}\,{}_2F_1\left(1,\frac{c+2 i a k-i a m}{2 c};\frac{3 c+2 i a k-i a m}{2 c};-e^{2 c z}\right)}{c+2 i a k-i a m}\right) + 2^{-m-u+1}\binom{m}{\frac{m}{2}}(1-m \bmod 2)\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(\frac{e^{(c-2 b s+b u) z}\,{}_2F_1\left(1,\frac{c-2 b s+b u}{2 c};\frac{3 c-2 b s+b u}{2 c};-e^{2 c z}\right)}{c-2 b s+b u} + \frac{e^{(c+2 b s-b u) z}\,{}_2F_1\left(1,\frac{c+2 b s-b u}{2 c};\frac{3 c+2 b s-b u}{2 c};-e^{2 c z}\right)}{c+2 b s-b u}\right) + i^{-m}\, 2^{-m-u+1}\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\Bigg(\left(e^{(c-2 i a k+i a m-2 b s+b u) z}\,{}_2F_1\left(1,\frac{c-2 i a k+i a m-2 b s+b u}{2 c};\frac{3 c-2 i a k+i a m-2 b s+b u}{2 c};-e^{2 c z}\right)\right)\Big/(c-2 i a k+i a m-2 b s+b u) + \left(e^{i \pi m+(c+2 i a k-i a m-2 b s+b u) z}\,{}_2F_1\left(1,\frac{c+2 i a k-i a m-2 b s+b u}{2 c};\frac{3 c+2 i a k-i a m-2 b s+b u}{2 c};-e^{2 c z}\right)\right)\Big/(c+2 i a k-i a m-2 b s+b u) + \left(e^{(c-2 i a k+i a m+2 b s-b u) z}\,{}_2F_1\left(1,\frac{c-2 i a k+i a m+2 b s-b u}{2 c};\frac{3 c-2 i a k+i a m+2 b s-b u}{2 c};-e^{2 c z}\right)\right)\Big/(c-2 i a k+i a m+2 b s-b u) + \left(e^{i \pi m+(c+2 i a k-i a m+2 b s-b u) z}\,{}_2F_1\left(1,\frac{c+2 i a k-i a m+2 b s-b u}{2 c};\frac{3 c+2 i a k-i a m+2 b s-b u}{2 c};-e^{2 c z}\right)\right)\Big/(c+2 i a k-i a m+2 b s-b u)\Bigg) /; m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

## Involving cos and cosh

### Involving $\cos(a z)\cosh(b z)\operatorname{sech}(c z)$

01.24.21.0207.01

$$\int \cos(a z)\cosh(b z)\operatorname{sech}(c z)\,dz = \frac{1}{2}\left(\frac{e^{(-b+c-i a) z}\,{}_2F_1\left(1,\frac{-b+c-i a}{2 c};\frac{-b+3 c-i a}{2 c};-e^{2 c z}\right)}{-b+c-i a} + \frac{e^{(-b+c+i a) z}\,{}_2F_1\left(1,\frac{-b+c+i a}{2 c};\frac{-b+3 c+i a}{2 c};-e^{2 c z}\right)}{-b+c+i a} + \frac{e^{(b+c-i a) z}\,{}_2F_1\left(1,\frac{b+c-i a}{2 c};\frac{b+3 c-i a}{2 c};-e^{2 c z}\right)}{b+c-i a} + \frac{e^{(b+c+i a) z}\,{}_2F_1\left(1,\frac{b+c+i a}{2 c};\frac{b+3 c+i a}{2 c};-e^{2 c z}\right)}{b+c+i a}\right)$$

## Involving powers of cos and powers of cosh

### Involving $\cos^m(a z) \cosh^u(b z) \operatorname{sech}(c z)$

01.24.21.0208.01

$$\int \cos^m(a z) \cosh^u(b z) \operatorname{sech}(c z)\, dz = 2^{-m-u+1} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left( \frac{e^{(c-2 i a k+i a m) z}\, {}_2F_1\left(1, \frac{c-2 i a k+i a m}{2 c}; \frac{3 c-2 i a k+i a m}{2 c}; -e^{2 c z}\right)}{c - 2 i a k + i a m} + \frac{e^{(c+2 i a k-i a m) z}\, {}_2F_1\left(1, \frac{c+2 i a k-i a m}{2 c}; \frac{3 c+2 i a k-i a m}{2 c}; -e^{2 c z}\right)}{c + 2 i a k - i a m} \right) + \frac{2^{-m-u+1} \tan^{-1}(e^{c z}) (1 - m \bmod 2)(1 - u \bmod 2)}{c} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} + 2^{-m-u+1} \binom{m}{\frac{m}{2}} (1 - m \bmod 2) \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left( \frac{e^{(c-2 b s+b u) z}\, {}_2F_1\left(1, \frac{c-2 b s+b u}{2 c}; \frac{3 c-2 b s+b u}{2 c}; -e^{2 c z}\right)}{c - 2 b s + b u} + \frac{e^{(c+2 b s-b u) z}\, {}_2F_1\left(1, \frac{c+2 b s-b u}{2 c}; \frac{3 c+2 b s-b u}{2 c}; -e^{2 c z}\right)}{c + 2 b s - b u} \right) + 2^{-m-u+1} \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left( \left( e^{(c-2 i a k+i a m-2 b s+b u) z}\, {}_2F_1\left(1, \frac{c - 2 i a k + i a m - 2 b s + b u}{2 c}; \frac{3 c - 2 i a k + i a m - 2 b s + b u}{2 c}; -e^{2 c z}\right)\right) \Big/ (c - 2 i a k + i a m - 2 b s + b u) + \left( e^{(c+2 i a k-i a m-2 b s+b u) z}\, {}_2F_1\left(1, \frac{c + 2 i a k - i a m - 2 b s + b u}{2 c}; \frac{3 c + 2 i a k - i a m - 2 b s + b u}{2 c}; -e^{2 c z}\right)\right) \Big/ (c + 2 i a k - i a m - 2 b s + b u) + \left( e^{(c-2 i a k+i a m+2 b s-b u) z}\, {}_2F_1\left(1, \frac{c - 2 i a k + i a m + 2 b s - b u}{2 c}; \frac{3 c - 2 i a k + i a m + 2 b s - b u}{2 c}; -e^{2 c z}\right)\right) \Big/ (c - 2 i a k + i a m + 2 b s - b u) + \left( e^{(c+2 i a k-i a m+2 b s-b u) z}\, {}_2F_1\left(1, \frac{c + 2 i a k - i a m + 2 b s - b u}{2 c}; \frac{3 c + 2 i a k - i a m + 2 b s - b u}{2 c}; -e^{2 c z}\right)\right) \Big/ (c + 2 i a k - i a m + 2 b s - b u) \right) \;/;\; m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

## Involving sin and tanh

### Involving $\sin(a z) \tanh(c z) \operatorname{sech}(c z)$

01.24.21.0209.01

$$\int \sin(a z) \tanh(c z) \operatorname{sech}(c z) \, dz = e^{2 c z} \left( -\frac{e^{-\frac{1}{2}(i\pi)+(i a-c) z} \, {}_2F_1\left(2, \frac{1}{2} + \frac{i a}{2 c}; \frac{3}{2} + \frac{i a}{2 c}; -e^{2 c z}\right)}{c + i a} + \frac{e^{-\frac{1}{2}(i\pi)+(c+i a) z} \, {}_2F_1\left(2, \frac{3}{2} + \frac{i a}{2 c}; \frac{5}{2} + \frac{i a}{2 c}; -e^{2 c z}\right)}{3 c + i a} - \frac{e^{\frac{i\pi}{2}+(-c-i a) z} \, {}_2F_1\left(2, \frac{1}{2} - \frac{i a}{2 c}; \frac{3}{2} - \frac{i a}{2 c}; -e^{2 c z}\right)}{c - i a} + \frac{e^{\frac{i\pi}{2}+(c-i a) z} \, {}_2F_1\left(2, \frac{3}{2} - \frac{i a}{2 c}; \frac{5}{2} - \frac{i a}{2 c}; -e^{2 c z}\right)}{3 c - i a} \right)$$

## Involving powers of sin and powers of tanh

### Involving $\sin^m(a z) \tanh^u(c z) \operatorname{sech}(c z)$

01.24.21.0210.01

$$\int \sin^m(a z) \tanh^\mu(c z) \operatorname{sech}(c z) \, dz = 2^{1-m} e^{-c z} \left(1 - e^{-2 c z}\right)^{-\mu} \left(1 + e^{-2 c z}\right)^\mu \left( \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \left( \frac{e^{i a (m-2 k) z - \frac{i m \pi}{2}} F_1\left(-\frac{i a (m-2 k) - c}{2 c}; \mu + 1, -\mu; \frac{1}{2}\left(3 - \frac{i a (m-2 k)}{c}\right); -e^{-2 c z}, e^{-2 c z}\right)}{i a (m - 2 k) - c} + \frac{1}{-c - i a (m - 2 k)} \left( e^{\frac{i m \pi}{2} - i a (m-2 k) z} F_1\left(-\frac{-c - i a (m - 2 k)}{2 c}; \mu + 1, -\mu; \frac{1}{2}\left(\frac{a i (m - 2 k)}{c} + 3\right); -e^{-2 c z}, e^{-2 c z}\right)\right)\right) \binom{m}{k} \right) \tanh^\mu(c z) - \frac{1}{c} \left( 2^{1-m} e^{-c z} \left(1 - e^{-2 c z}\right)^{-\mu} \left(1 + e^{-2 c z}\right)^\mu F_1\left(\frac{1}{2}; \mu + 1, -\mu; \frac{3}{2}; -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} (1 - m \bmod 2) \tanh^\mu(c z) \right) /; m \in \mathbb{N}^+$$

01.24.21.0211.01

$$\int \sin^m(a z)\tanh^u(c z)\operatorname{sech}(c z)\,dz = \frac{i^u 2^{1-m} e^{c(u+1)z}(1-m \bmod 2)(1-u \bmod 2)}{c(u+1)}\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}\,{}_2F_1\left(\frac{u}{2}+\frac{1}{2}, u+1; \frac{u}{2}+\frac{3}{2}; -e^{2cz}\right) + i^{m+u} 2^{1-m} e^{c(u+1)z}\binom{u}{\frac{u}{2}} (1-u \bmod 2)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(\left((-1)^m e^{i a(m-2k)z}\,{}_2F_1\left(-\frac{i a k}{c}+\frac{i a m}{2c}+\frac{u}{2}+\frac{1}{2}, u+1; -\frac{i a k}{c}+\frac{i a m}{2c}+\frac{u}{2}+\frac{3}{2}; -e^{2cz}\right)\right)\Big/ (a i(m-2k)+c(u+1)) + \frac{e^{-i a(m-2k)z}\,{}_2F_1\left(\frac{i a k}{c}+\frac{u}{2}+\frac{1}{2}-\frac{i a m}{2c}, u+1; \frac{i a k}{c}+\frac{u}{2}+\frac{3}{2}-\frac{i a m}{2c}; -e^{2cz}\right)}{a i(2k-m)+c(u+1)}\right) + 2^{1-m} e^{c(u+1)z}\binom{m}{\frac{m}{2}}(1-m \bmod 2)\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}\left(\frac{(-1)^u e^{-c(u-2s)z}\,{}_2F_1\left(s+\frac{1}{2}, u+1; s+\frac{3}{2}; -e^{2cz}\right)}{c(2s+1)} + \frac{e^{c(u-2s)z}\,{}_2F_1\left(u+1, -s+u+\frac{1}{2}; -s+u+\frac{3}{2}; -e^{2cz}\right)}{c(-2s+2u+1)}\right) + 2^{1-m} e^{c(u+1)z}\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}\left(\frac{1}{2sc+c-2iak+iam}\left((-1)^u e^{(i a(m-2k)-c(u-2s))z-\frac{i m\pi}{2}}\,{}_2F_1\left(-\frac{i a k}{c}+\frac{i a m}{2c}+s+\frac{1}{2}, u+1; -\frac{i a k}{c}+\frac{i a m}{2c}+s+\frac{3}{2}; -e^{2cz}\right)\right) + \frac{1}{2sc+c+2iak-iam}\left((-1)^u e^{\frac{i\pi m}{2}+(-i a(m-2k)-c(u-2s))z}\,{}_2F_1\left(\frac{i a k}{c}+s+\frac{1}{2}-\frac{i a m}{2c}, u+1; \frac{i a k}{c}+s+\frac{3}{2}-\frac{i a m}{2c}; -e^{2cz}\right)\right) + \left(e^{(a i(m-2k)+c(u-2s))z-\frac{i m\pi}{2}}\,{}_2F_1\left(u+1, -\frac{i a k}{c}+\frac{i a m}{2c}-s+u+\frac{1}{2}; -\frac{i a k}{c}+\frac{i a m}{2c}-s+u+\frac{3}{2}; -e^{2cz}\right)\right)\Big/ (a i(m-2k)+c(-2s+2u+1)) + \left(e^{\frac{i\pi m}{2}+(c(u-2s)-i a(m-2k))z}\,{}_2F_1\left(u+1, \frac{i a k}{c}-s+u+\frac{1}{2}-\frac{i a m}{2c}; \frac{i a k}{c}-s+u+\frac{3}{2}-\frac{i a m}{2c}; -e^{2cz}\right)\right)\Big/ (a i(2k-m)+c(-2s+2u+1))\right) /; m\in\mathbb{N}^+ \land u\in\mathbb{N}^+$$

## Involving cos and tanh

### Involving cos(*a z*) tanh(*c z*) sech(*c z*)

01.24.21.0212.01

$$\int \cos(a z)\tanh(c z)\operatorname{sech}(c z)\,dz = e^{2cz}\left(-\frac{e^{(i a-c)z}\,{}_2F_1\left(2, \frac{1}{2}+\frac{i a}{2c}; \frac{3}{2}+\frac{i a}{2c}; -e^{2cz}\right)}{c+i a} + \frac{e^{(c+i a)z}\,{}_2F_1\left(2, \frac{3}{2}+\frac{i a}{2c}; \frac{5}{2}+\frac{i a}{2c}; -e^{2cz}\right)}{3c+i a} - \frac{e^{(-c-i a)z}\,{}_2F_1\left(2, \frac{1}{2}-\frac{i a}{2c}; \frac{3}{2}-\frac{i a}{2c}; -e^{2cz}\right)}{c-i a} + \frac{e^{(c-i a)z}\,{}_2F_1\left(2, \frac{3}{2}-\frac{i a}{2c}; \frac{5}{2}-\frac{i a}{2c}; -e^{2cz}\right)}{3c-i a}\right)$$

## Involving powers of cos and powers of tanh

### Involving $\cos^m(a z) \tanh^\mu(c z) \operatorname{sech}(c z)$

01.24.21.0213.01

$$\int \cos^m(a z) \tanh^\mu(c z) \operatorname{sech}(c z) \, dz = 2^{1-m} e^{-c z} \left(1 - e^{-2 c z}\right)^{-\mu} \left(1 + e^{-2 c z}\right)^{\mu} \tanh^\mu(c z) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \left( \frac{e^{i a (m-2k) z} F_1\left(-\frac{i a (m-2k)-c}{2 c}; \mu+1, -\mu; \frac{1}{2}\left(3 - \frac{i a (m-2k)}{c}\right); -e^{-2 c z}, e^{-2 c z}\right)}{i a (m-2k) - c} + \frac{e^{-i a (m-2k) z} F_1\left(-\frac{-c - i a (m-2k)}{2 c}; \mu+1, -\mu; \frac{1}{2}\left(\frac{a i (m-2k)}{c} + 3\right); -e^{-2 c z}, e^{-2 c z}\right)}{-c - i a (m-2k)} \right) \binom{m}{k} - \frac{1}{c} 2^{1-m} e^{-c z} \left(1 - e^{-2 c z}\right)^{-\mu} \left(1 + e^{-2 c z}\right)^{\mu} F_1\left(\frac{1}{2}; \mu+1, -\mu; \frac{3}{2}; -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} (1 - m \bmod 2) \tanh^\mu(c z) \;/;\; m \in \mathbb{N}^+$$

01.24.21.0214.01

$$\int \cos^m(a z)\tanh^u(c z)\operatorname{sech}(c z)\,dz = \frac{i^u\, 2^{1-m}\, e^{c(u+1)z}\,(1-m \bmod 2)(1-u \bmod 2)}{c(u+1)}\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}\,{}_2F_1\!\left(\frac{u}{2}+\frac{1}{2},\,u+1;\,\frac{u}{2}+\frac{3}{2};\,-e^{2cz}\right) - i^u\, 2^{1-m}\, e^{c(u+1)z}\binom{u}{\frac{u}{2}}(u \bmod 2-1)\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(\frac{e^{-i a(m-2s)z}\,{}_2F_1\!\left(-\frac{i a m}{2c}+\frac{i a s}{c}+\frac{u}{2}+\frac{1}{2},\,u+1;\,-\frac{i a m}{2c}+\frac{i a s}{c}+\frac{u}{2}+\frac{3}{2};\,-e^{2cz}\right)}{c(u+1)-i a(m-2s)} + \frac{e^{i a(m-2s)z}\,{}_2F_1\!\left(\frac{i a m}{2c}+\frac{u}{2}+\frac{1}{2}-\frac{i a s}{c},\,u+1;\,\frac{i a m}{2c}+\frac{u}{2}+\frac{3}{2}-\frac{i a s}{c};\,-e^{2cz}\right)}{a i(m-2s)+c(u+1)}\right) + 2^{1-m}\, e^{c(u+1)z}\binom{m}{\frac{m}{2}}(1-m \bmod 2)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\left(\frac{(-1)^u\, e^{-c(u-2k)z}\,{}_2F_1\!\left(k+\frac{1}{2},\,u+1;\,k+\frac{3}{2};\,-e^{2cz}\right)}{c(2k+1)} + \frac{e^{c(u-2k)z}\,{}_2F_1\!\left(u+1,\,-k+u+\frac{1}{2};\,-k+u+\frac{3}{2};\,-e^{2cz}\right)}{c(-2k+2u+1)}\right) + 2^{1-m}\, e^{c(u+1)z}\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{s}\binom{u}{k}\left(\left((-1)^u\, e^{(-i a(m-2s)-c(u-2k))z}\,{}_2F_1\!\left(k+\frac{i a s}{c}+\frac{1}{2}-\frac{i a m}{2c},\,u+1;\,k+\frac{i a s}{c}+\frac{3}{2}-\frac{i a m}{2c};\,-e^{2cz}\right)\right)\Big/(c(2k+1)-i a(m-2s)) + \left((-1)^u\, e^{(i a(m-2s)-c(u-2k))z}\,{}_2F_1\!\left(k+\frac{i a m}{2c}+\frac{1}{2}-\frac{i a s}{c},\,u+1;\,k+\frac{i a m}{2c}+\frac{3}{2}-\frac{i a s}{c};\,-e^{2cz}\right)\right)\Big/(c(2k+1)+a i(m-2s)) + \left(e^{(c(u-2k)-i a(m-2s))z}\,{}_2F_1\!\left(u+1,\,-k+\frac{i a s}{c}+u+\frac{1}{2}-\frac{i a m}{2c};\,-k+\frac{i a s}{c}+u+\frac{3}{2}-\frac{i a m}{2c};\,-e^{2cz}\right)\right)\Big/(c(-2k+2u+1)-i a(m-2s)) + \left(e^{(a i(m-2s)+c(u-2k))z}\,{}_2F_1\!\left(u+1,\,-k+\frac{i a m}{2c}+u+\frac{1}{2}-\frac{i a s}{c};\,-k+\frac{i a m}{2c}+u+\frac{3}{2}-\frac{i a s}{c};\,-e^{2cz}\right)\right)\Big/(a i(m-2s)+c(-2k+2u+1))\right)\ /;\ m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

## Involving sin and coth

### Involving $\sin(a z)\coth(c z)\operatorname{sech}(c z)$

01.24.21.0215.01

$$\int \sin(a z)\coth(c z)\operatorname{sech}(c z)\,dz = i\, e^{-cz}\left(\frac{e^{i a z}\,{}_2F_1\!\left(-\frac{i a-c}{2c},\,1;\,\frac{1}{2}\left(3-\frac{i a}{c}\right);\,e^{-2cz}\right)}{c-i a} - \frac{e^{-i a z}\,{}_2F_1\!\left(\frac{c+i a}{2c},\,1;\,\frac{1}{2}\left(3+\frac{i a}{c}\right);\,e^{-2cz}\right)}{c+i a}\right)$$

## Involving powers of sin and powers of coth

### Involving $\sin^m(a z)\coth^\mu(c z)\operatorname{sech}(c z)$

01.24.21.0216.01

$$\int \sin^m(a z)\coth^\mu(c z)\operatorname{sech}(c z)\,dz = 2^{1-m} e^{-c z}\left(1-e^{-2 c z}\right)^\mu \left(1+e^{-2 c z}\right)^{-\mu} \coth^\mu(c z)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k \left(\frac{e^{i a (m-2k) z-\frac{i m\pi}{2}} F_1\left(-\frac{i a (m-2k)-c}{2c}; 1-\mu, \mu; \frac{1}{2}\left(3-\frac{i a (m-2k)}{c}\right); -e^{-2 c z}, e^{-2 c z}\right)}{i a (m-2k)-c} + \frac{e^{\frac{i m\pi}{2}-i a (m-2k) z} F_1\left(-\frac{-c-i a (m-2k)}{2c}; 1-\mu, \mu; \frac{1}{2}\left(\frac{a i (m-2k)}{c}+3\right); -e^{-2 c z}, e^{-2 c z}\right)}{-c-i a (m-2k)}\right)\binom{m}{k} - \frac{1}{c} 2^{1-m} e^{-c z}\left(1-e^{-2 c z}\right)^\mu\left(1+e^{-2 c z}\right)^{-\mu} F_1\left(\frac{1}{2}; 1-\mu, \mu; \frac{3}{2}; -e^{-2 c z}, e^{-2 c z}\right)\binom{m}{\frac{m}{2}}\coth^\mu(c z)\,(1-m \bmod 2) \;/;\; m\in\mathbb{N}^+$$

Involving cos and coth

## Involving $\cos(a z)\coth(c z)\operatorname{sech}(c z)$

01.24.21.0217.01

$$\int \cos(a z)\coth(c z)\operatorname{sech}(c z)\,dz = \frac{1}{(a+i c)(c+i a)} e^{-i a z}\left((a-i c) e^{c z}\,{}_2F_1\left(\frac{c-i a}{2c}, 1; \frac{3}{2}-\frac{i a}{2c}; e^{2 c z}\right) - (a+i c) e^{(c+2 i a) z}\,{}_2F_1\left(\frac{c+i a}{2c}, 1; \frac{3}{2}+\frac{i a}{2c}; e^{2 c z}\right)\right)$$

Involving powers of cos and powers of coth

## Involving $\cos^m(a z)\coth^\mu(c z)\operatorname{sech}(c z)$

01.24.21.0218.01

$$\int \cos^m(a z)\coth^\mu(c z)\operatorname{sech}(c z)\,dz = 2^{1-m} e^{-c z}\left(1-e^{-2 c z}\right)^\mu \left(1+e^{-2 c z}\right)^{-\mu} \coth^\mu(c z)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\left(\frac{e^{i a (m-2k) z} F_1\left(-\frac{i a (m-2k)-c}{2c}; 1-\mu, \mu; \frac{1}{2}\left(3-\frac{i a (m-2k)}{c}\right); -e^{-2 c z}, e^{-2 c z}\right)}{i a (m-2k)-c} + \frac{e^{-i a (m-2k) z} F_1\left(-\frac{-c-i a (m-2k)}{2c}; 1-\mu, \mu; \frac{1}{2}\left(\frac{a i (m-2k)}{c}+3\right); -e^{-2 c z}, e^{-2 c z}\right)}{-c-i a (m-2k)}\right)\binom{m}{k} - \frac{1}{c}\left(2^{1-m} e^{-c z}\left(1-e^{-2 c z}\right)^\mu\left(1+e^{-2 c z}\right)^{-\mu} F_1\left(\frac{1}{2}; 1-\mu, \mu; \frac{3}{2}; -e^{-2 c z}, e^{-2 c z}\right)\binom{m}{\frac{m}{2}}\coth^\mu(c z)\,(1-m \bmod 2)\right) \;/;\; m\in\mathbb{N}^+$$

Involving sin and csch

## Involving $\sin(a z)\operatorname{csch}(c z)\operatorname{sech}(c z)$

01.24.21.0219.01

$$\int \sin(a z) \operatorname{csch}(c z) \operatorname{sech}(c z) \, dz = -2 i e^{-2 c z} \left( \frac{e^{-i a z}}{2 c + i a} \, {}_2F_1\left(1, \frac{1}{2} + \frac{i a}{4 c}; \frac{3}{2} + \frac{i a}{4 c}; e^{-4 c z}\right) + \frac{e^{i a z}}{i a - 2 c} \, {}_2F_1\left(1, \frac{1}{2} - \frac{i a}{4 c}; \frac{3}{2} - \frac{i a}{4 c}; e^{-4 c z}\right)\right)$$

Involving powers of sin and powers of csch

## Involving $\sin^m(a z) \operatorname{csch}^\mu(c z) \operatorname{sech}(c z)$

01.24.21.0220.01

$$\int \sin^m(a z) \operatorname{csch}^\mu(c z) \operatorname{sech}(c z) \, dz = 2^{1-m} e^{-c z} \left(1 - e^{-2 c z}\right)^\mu \operatorname{csch}^\mu(c z) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \left( \frac{e^{i a (m - 2 k) z - \frac{i m \pi}{2}} F_1\left(\frac{c(\mu+1) - i a (m - 2 k)}{2 c}; 1, \mu; \frac{c(\mu+3) - i a (m - 2 k)}{2 c}; -e^{-2 c z}, e^{-2 c z}\right)}{i a (m - 2 k) - c (\mu + 1)} + \frac{e^{\frac{i m \pi}{2} - i a (m - 2 k) z} F_1\left(\frac{a i (m - 2 k) + c(\mu+1)}{2 c}; 1, \mu; \frac{a i (m - 2 k) + c(\mu+3)}{2 c}; -e^{-2 c z}, e^{-2 c z}\right)}{-i a (m - 2 k) - c (\mu + 1)} \right) \binom{m}{k} - \frac{2^{1-m} e^{-c z} \left(1 - e^{-2 c z}\right)^\mu \operatorname{csch}^\mu(c z) (1 - m \bmod 2)}{c (\mu + 1)} F_1\left(\frac{\mu + 1}{2}; 1, \mu; \frac{\mu + 3}{2}; -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} \;/;\; m \in \mathbb{N}^+$$

Involving cos and csch

## Involving $\cos(a z) \operatorname{csch}(c z) \operatorname{sech}(c z)$

01.24.21.0221.01

$$\int \cos(a z) \operatorname{csch}(c z) \operatorname{sech}(c z) \, dz = 2 e^{-2 c z} \left( \frac{e^{-i a z} \, {}_2F_1\left(1, \frac{1}{2} + \frac{i a}{4 c}; \frac{3}{2} + \frac{i a}{4 c}; e^{-4 c z}\right)}{-2 c - i a} + \frac{e^{i a z} \, {}_2F_1\left(1, \frac{1}{2} - \frac{i a}{4 c}; \frac{3}{2} - \frac{i a}{4 c}; e^{-4 c z}\right)}{i a - 2 c} \right)$$

Involving powers of cos and powers of csch

## Involving $\cos^m(a z) \operatorname{csch}^\mu(c z) \operatorname{sech}(c z)$

01.24.21.0222.01

$$\int \cos^m(a z)\,\text{csch}^\mu(c z)\,\text{sech}(c z)\,dz = 2^{1-m} e^{-c z} \left(1 - e^{-2 c z}\right)^\mu \text{csch}^\mu(c z) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \left( \frac{e^{i a (m-2k) z} F_1\left(\frac{c(\mu+1) - i a (m-2k)}{2c}; 1, \mu; \frac{c(\mu+3) - i a(m-2k)}{2c}; -e^{-2 c z}, e^{-2 c z}\right)}{i a (m-2k) - c(\mu+1)} + \frac{e^{-i a (m-2k) z} F_1\left(\frac{a i (m-2k) + c(\mu+1)}{2c}; 1, \mu; \frac{a i (m-2k) + c(\mu+3)}{2c}; -e^{-2 c z}, e^{-2 c z}\right)}{-i a (m-2k) - c(\mu+1)} \right) \binom{m}{k} - \frac{2^{1-m} e^{-c z} \left(1 - e^{-2 c z}\right)^\mu \text{csch}^\mu(c z)(1 - m \bmod 2)}{c(\mu+1)} F_1\left(\frac{\mu+1}{2}; 1, \mu; \frac{\mu+3}{2}; -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} /; m \in \mathbb{N}^+$$

## Involving hyperbolic, exponential and a power functions

### Involving sinh, exp and power

#### Involving $z^n e^{p z} \sinh(b z)\,\text{sech}(c z)$

01.24.21.0223.01

$$\int z^n e^{p z} \sinh(a + b z)\,\text{sech}(c z)\,dz = e^{c z} n! \left( e^{a + (b+p) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j}\right)}{(n-j)!\,(b+c+p)^{j+1}}\, {}_{j+2}F_{j+1}\left(\frac{b+c+p}{2c}, \ldots, \frac{b+c+p}{2c}, 1; \frac{b+c+p}{2c} + 1, \ldots, \frac{b+c+p}{2c} + 1; -e^{2 c z}\right) - e^{(p-b) z - a} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j}\right)}{(n-j)!\,(-b+c+p)^{j+1}}\, {}_{j+2}F_{j+1}\left(\frac{-b+c+p}{2c}, \ldots, \frac{-b+c+p}{2c}, 1; \frac{-b+c+p}{2c} + 1, \ldots, \frac{-b+c+p}{2c} + 1; -e^{2 c z}\right)\right) /; n \in \mathbb{N} \land b + p \neq -c \land p - b \neq -c$$

01.24.21.0224.01

$$\int z^n e^{(b-c) z} \sinh(a + b z)\,\text{sech}(c z)\,dz = -\frac{e^{-a} z^{n+1}}{n+1} + e^{a + 2 b z} n! \sum_{j=0}^{n} \frac{(-1)^j z^{n-j}}{(n-j)!\,(2b)^{j+1}}\, {}_{j+2}F_{j+1}\left(\frac{b}{c}, \ldots, \frac{b}{c}, 1; \frac{b}{c} + 1, \ldots, \frac{b}{c} + 1; -e^{2 c z}\right) + n!\, e^{-a + 2 c z} \sum_{j=0}^{n} \frac{(-1)^j (2c)^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(1, \ldots, 1, 1; 2, \ldots, 2; -e^{2 c z}\right) /; n \in \mathbb{N}$$

01.24.21.0225.01

$$\int z^n e^{-(b+c)z} \sinh(a+bz)\operatorname{sech}(cz)\,dz = \frac{e^a z^{n+1}}{n+1} + n!\, e^{-a-2bz} \sum_{j=0}^{n} \frac{z^{n-j}}{(n-j)!\,(2b)^{j+1}}\, {}_{j+2}F_{j+1}\!\left(-\frac{b}{c}, \ldots, -\frac{b}{c}, 1; -\frac{b}{c}+1, \ldots, -\frac{b}{c}+1; -e^{2cz}\right) - n!\, e^{a+2cz} \sum_{j=0}^{n} \frac{(-1)^j (2c)^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(1, \ldots, 1, 1; 2, \ldots, 2; -e^{2cz}\right) /; n \in \mathbb{N}$$

01.24.21.0226.01

$$\int z^n e^{pz} \sinh(bz)\operatorname{sech}(cz)\,dz = \frac{1}{2} e^{cz} n! \left(-e^{(-b+p)z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-b+p+c)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(\frac{c+p-b}{2c}, \ldots, \frac{c+p-b}{2c}, 1; \frac{c+p-b}{2c}+1, \ldots, \frac{c+p-b}{2c}+1; -e^{2cz}\right) + e^{(b+p)z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b+p+c)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(\frac{c+p+b}{2c}, \ldots, \frac{c+p+b}{2c}, 1; \frac{c+p+b}{2c}+1, \ldots, \frac{c+p+b}{2c}+1; -e^{2cz}\right) + e^{(b+p)z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b+p+c)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(\frac{c+p+b}{2c}, \ldots, \frac{c+p+b}{2c}, 1; \frac{c+p+b}{2c}+1, \ldots, \frac{c+p+b}{2c}+1; -e^{2cz}\right) - e^{(-b+p)z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-b+p+c)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(\frac{c+p-b}{2c}, \ldots, \frac{c+p-b}{2c}, 1; \frac{c+p-b}{2c}+1, \ldots, \frac{c+p-b}{2c}+1; -e^{2cz}\right)\right) /; n \in \mathbb{N}$$

01.24.21.0227.01

$$\int z^n e^{(b-c)z} \sinh(bz)\operatorname{sech}(cz)\,dz = -\frac{z^{n+1}}{n+1} + e^{2cz} n! \sum_{j=0}^{n} \frac{\left((-1)^j (2c)^{-j-1} z^{n-j}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(1, \ldots, 1; 2, \ldots, 2; -e^{2cz}\right) + e^{2bz} n! \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j}\right)}{(n-j)!\,(2b)^{j+1}}\, {}_{j+2}F_{j+1}\!\left(\frac{b}{c}, \ldots, \frac{b}{c}, 1; \frac{b}{c}+1, \ldots, \frac{b}{c}+1; -e^{2cz}\right) /; n \in \mathbb{N}$$

01.24.21.0228.01

$$\int z^n e^{-(b+c)z} \sinh(bz)\operatorname{sech}(cz)\,dz = \frac{z^{n+1}}{n+1} + n!\, e^{-2bz} \sum_{j=0}^{n} \frac{z^{n-j}}{(n-j)!\,(2b)^{j+1}}\, {}_{j+2}F_{j+1}\!\left(-\frac{b}{c}, \ldots, -\frac{b}{c}, 1; -\frac{b}{c}+1, \ldots, -\frac{b}{c}+1; -e^{2cz}\right) - n!\, e^{2cz} \sum_{j=0}^{n} \frac{(-1)^j (2c)^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(1, \ldots, 1, 1; 2, \ldots, 2; -e^{2cz}\right) /; n \in \mathbb{N}$$

## Involving powers of sinh, exp and power

### Involving $z^n e^{pz} \sinh^u(bz)\operatorname{sech}(cz)$

01.24.21.0229.01

$$\int z^n e^{pz} \sinh^u(bz)\operatorname{sech}(cz)\,dz = 2^{1-u} e^{(p+c)z} \binom{u}{\frac{u}{2}} i^u n!\,(1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c+p}{2c}, \ldots, \frac{c+p}{2c}, 1; \frac{c+p}{2c}+1, \ldots, \frac{c+p}{2c}+1; -e^{2cz}\right) + 2^{1-u} n!\, e^{cz} \sum_{k=0}^{\lfloor \frac{u-1}{2} \rfloor} (-1)^k \binom{u}{k} \left(e^{(p+b(u-2k))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+b(u-2k)+c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c+p+b(-2k+u)}{2c}, \ldots, \frac{c+p+b(-2k+u)}{2c}, 1; \frac{c+p+b(-2k+u)}{2c}+1, \ldots, \frac{c+p+b(-2k+u)}{2c}+1; -e^{2cz}\right) + (-1)^u e^{(p-b(u-2k))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p-b(u-2k)+c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c+p-b(-2k+u)}{2c}, \ldots, \frac{c+p-b(-2k+u)}{2c}, 1; \frac{c+p-b(-2k+u)}{2c}+1, \ldots, \frac{c+p-b(-2k+u)}{2c}+1; -e^{2cz}\right)\right) /;\ n \in \mathbb{N} \land u \in \mathbb{N}^+$$

## Involving cosh, exp and power

### Involving $z^n e^{pz} \cosh(bz)\operatorname{sech}(cz)$

01.24.21.0230.01

$$\int z^n e^{pz} \cosh(a+bz)\operatorname{sech}(cz)\,dz = e^{cz} n! \left(e^{(p-b)z-a} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j}\right)}{(n-j)!\,(-b+c+p)^{j+1}} {}_{j+2}F_{j+1}\left(\frac{-b+c+p}{2c}, \ldots, \frac{-b+c+p}{2c}, 1; \frac{-b+c+p}{2c}+1, \ldots, \frac{-b+c+p}{2c}+1; -e^{2cz}\right) + e^{a+(b+p)z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j}\right)}{(n-j)!\,(b+c+p)^{j+1}} {}_{j+2}F_{j+1}\left(\frac{b+c+p}{2c}, \ldots, \frac{b+c+p}{2c}, 1; \frac{b+c+p}{2c}+1, \ldots, \frac{b+c+p}{2c}+1; -e^{2cz}\right)\right) /;\ n \in \mathbb{N} \land b+p \neq -c \land p-b \neq -c$$

01.24.21.0231.01

$$\int z^n e^{(b-c)z} \cosh(a+bz)\operatorname{sech}(cz)\,dz = \frac{e^{-a} z^{n+1}}{n+1} + n!\, e^{a+2bz} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j}}{(n-j)!\,(2b)^{j+1}} {}_{j+2}F_{j+1}\left(\frac{b}{c}, \ldots, \frac{b}{c}, 1; \frac{b}{c}+1, \ldots, \frac{b}{c}+1; -e^{2cz}\right) - n!\, e^{-a+2cz} \sum_{j=0}^{n} \frac{(-1)^j (2c)^{-j-1} z^{n-j}}{(n-j)!} {}_{j+2}F_{j+1}\left(1, \ldots, 1, 1; 2, \ldots, 2; -e^{2cz}\right) /;\ n \in \mathbb{N}$$

01.24.21.0232.01

$$\int z^n e^{-(b+c)z} \cosh(a+bz)\operatorname{sech}(cz)\,dz = \frac{e^a z^{n+1}}{n+1} - e^{-a-2bz} n! \sum_{j=0}^{n} \frac{z^{n-j}}{(n-j)!\,(2b)^{j+1}} {}_{j+2}F_{j+1}\left(-\frac{b}{c}, \ldots, -\frac{b}{c}, 1; -\frac{b}{c}+1, \ldots, -\frac{b}{c}+1; -e^{2cz}\right) - n!\, e^{a+2cz} \sum_{j=0}^{n} \frac{(-1)^j (2c)^{-j-1} z^{n-j}}{(n-j)!} {}_{j+2}F_{j+1}\left(1, \ldots, 1, 1; 2, \ldots, 2; -e^{2cz}\right) /; n \in \mathbb{N}$$

01.24.21.0233.01

$$\int z^n e^{pz} \cosh(bz)\operatorname{sech}(cz)\,dz = n!\, e^{cz} \left(e^{(-b+p)z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-b+p+c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c+p-b}{2c}, \ldots, \frac{c+p-b}{2c}, 1; \frac{c+p-b}{2c}+1, \ldots, \frac{c+p-b}{2c}+1; -e^{2cz}\right) + e^{(b+p)z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b+p+c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c+p+b}{2c}, \ldots, \frac{c+p+b}{2c}, 1; \frac{c+p+b}{2c}+1, \ldots, \frac{c+p+b}{2c}+1; -e^{2cz}\right)\right) /; n \in \mathbb{N}$$

01.24.21.0234.01

$$\int z^n e^{(b-c)z} \cosh(bz)\operatorname{sech}(cz)\,dz = \frac{z^{n+1}}{n+1} + n!\, e^{2bz} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j}}{(n-j)!\,(2b)^{j+1}} {}_{j+2}F_{j+1}\left(\frac{b}{c}, \ldots, \frac{b}{c}, 1; \frac{b}{c}+1, \ldots, \frac{b}{c}+1; -e^{2cz}\right) - n!\, e^{2cz} \sum_{j=0}^{n} \frac{(-1)^j (2c)^{-j-1} z^{n-j}}{(n-j)!} {}_{j+2}F_{j+1}\left(1, \ldots, 1, 1; 2, \ldots, 2; -e^{2cz}\right) /; n \in \mathbb{N}$$

01.24.21.0235.01

$$\int z^n e^{-(b+c)z} \cosh(bz)\operatorname{sech}(cz)\,dz = \frac{z^{n+1}}{n+1} - e^{-2bz} n! \sum_{j=0}^{n} \frac{z^{n-j}}{(n-j)!\,(2b)^{j+1}} {}_{j+2}F_{j+1}\left(-\frac{b}{c}, \ldots, -\frac{b}{c}, 1; -\frac{b}{c}+1, \ldots, -\frac{b}{c}+1; -e^{2cz}\right) - n!\, e^{2cz} \sum_{j=0}^{n} \frac{(-1)^j (2c)^{-j-1} z^{n-j}}{(n-j)!} {}_{j+2}F_{j+1}\left(1, \ldots, 1, 1; 2, \ldots, 2; -e^{2cz}\right) /; n \in \mathbb{N}$$

## Involving powers of cosh, exp and power

### Involving $z^n e^{pz} \cosh^u(bz)\operatorname{sech}(cz)$

01.24.21.0236.01

$$\int z^n e^{p z} \cosh^u(b z)\,\mathrm{sech}(c z)\,dz = e^{(p+c) z} \binom{u}{\frac{u}{2}} 2^{1-u}\, n!\, (1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+c)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(\frac{c+p}{2c}, \ldots, \frac{c+p}{2c}, 1; \frac{c+p}{2c}+1, \ldots, \frac{c+p}{2c}+1; -e^{2 c z}\right) + 2^{1-u}\, n!\, e^{c z} \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{k} \left(e^{(p+b(u-2k)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+b(u-2k)+c)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(\frac{c+p+b(-2k+u)}{2c}, \ldots, \frac{c+p+b(-2k+u)}{2c}, 1; \frac{c+p+b(-2k+u)}{2c}+1, \ldots, \frac{c+p+b(-2k+u)}{2c}+1; -e^{2 c z}\right) + e^{(p-b(u-2k)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p-b(u-2k)+c)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(\frac{c+p-b(-2k+u)}{2c}, \ldots, \frac{c+p-b(-2k+u)}{2c}, 1; \frac{c+p-b(-2k+u)}{2c}+1, \ldots, \frac{c+p-b(-2k+u)}{2c}+1; -e^{2 c z}\right)\right) /;\, n \in \mathbb{N} \land u \in \mathbb{N}^+$$

## Involving tanh, exp and power

### Involving $z^n e^{p z} \tanh(c z)\,\mathrm{sech}(c z)$

01.24.21.0237.01

$$\int z^n e^{p z} \tanh(c z)\,\mathrm{sech}(c z)\,dz = 2 e^{2 c z}\, n! \left(-e^{(-c+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+c)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(\frac{p+c}{2c}, \ldots, \frac{p+c}{2c}, 2; \frac{p+3c}{2c}, \ldots, \frac{p+3c}{2c}; -e^{2 c z}\right) + e^{(c+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+3c)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(\frac{p+3c}{2c}, \ldots, \frac{p+3c}{2c}, 2; \frac{p+5c}{2c}, \ldots, \frac{p+5c}{2c}; -e^{2 c z}\right)\right) /;\, n \in \mathbb{N}$$

01.24.21.0238.01

$$\int z^n e^{-c z} \tanh(c z)\,\mathrm{sech}(c z)\,dz = 2 e^{2 z c}\, n! \sum_{j=0}^{n} \frac{1}{(n-j)!} \left((-1)^j z^{n-j} (2c)^{-j-1} \left({}_{j+1}F_j\!\left(1, \ldots, 1; 2, \ldots, 2; -e^{2 c z}\right) + 2\, {}_{j+3}F_{j+2}\!\left(1, \ldots, 1, 3; 2, \ldots, 2; -e^{2 c z}\right)\right)\right) - \frac{2 z^{n+1}}{n+1} /;\, n \in \mathbb{N}$$

01.24.21.0239.01

$$\int z^n e^{-3 c z} \tanh(c z)\,\mathrm{sech}(c z)\,dz = \frac{6 z^{n+1}}{n+1} - 4 e^{2 c z}\, n! \sum_{j=0}^{n} \frac{(-1)^j (2c)^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+3}F_{j+2}\!\left(1, \ldots, 1, 3; 2, \ldots, 2; -e^{2 c z}\right) + 6\, n!\, e^{2 c z} \sum_{j=0}^{n} \frac{(-2c)^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+3}F_{j+2}\!\left(1, \ldots, 1, 4; 2, \ldots, 2, 3; -e^{2 c z}\right) + \frac{2^{-n}\, \Gamma(n+1, 2 c z)}{c^{n+1}} /;\, n \in \mathbb{N}$$

Involving powers of tanh, exp and power

## Involving $z^n e^{pz} \tanh^u(cz)\,\text{sech}(cz)$

01.24.21.0240.01

$$\int z^n e^{pz}\tanh^u(cz)\,\text{sech}(cz)\,dz = i^u\, 2\, e^{(p+c(u+1))z}\binom{u}{\frac{u}{2}} n!\,(1-u \bmod 2)\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(p+c(u+1))^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{p+c(u+1)}{2c}, \ldots, \frac{p+c(u+1)}{2c}, u+1; \frac{p+c(u+1)}{2c}+1, \ldots, \frac{p+c(u+1)}{2c}+1; -e^{2cz}\right) + 2\,n!\, e^{c(u+1)z}\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\left((-1)^u e^{(p-c(u-2k))z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(c(2k+1)+p)^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c(2k+1)+p}{2c}, \ldots, \frac{c(2k+1)+p}{2c}, u+1; \frac{c(2k+1)+p}{2c}+1, \ldots, \frac{c(2k+1)+p}{2c}+1; -e^{2cz}\right) + e^{(p+c(u-2k))z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(c(-2k+2u+1)+p)^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{p+c(-2k+2u+1)}{2c}, \ldots, \frac{p+c(-2k+2u+1)}{2c}, u+1; \frac{p+c(-2k+2u+1)}{2c}+1, \ldots, \frac{p+c(-2k+2u+1)}{2c}+1; -e^{2cz}\right)\right) /;\, n \in \mathbb{N} \land u \in \mathbb{N}^+$$

Involving coth, exp and power

## Involving $z^n e^{pz} \coth(cz)\,\text{sech}(cz)$

01.24.21.0241.01

$$\int z^n e^{pz}\coth(cz)\,\text{sech}(cz)\,dz = -2\, e^{cz}\, n!\, e^{pz}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^j z^{n-j}(p+c)^{-j-1}\, {}_{j+2}F_{j+1}\left(\frac{p+c}{2c}, \ldots, \frac{p+c}{2c}, 1; \frac{p+c}{2c}+1, \ldots, \frac{p+c}{2c}+1; e^{2cz}\right) /;\, n \in \mathbb{N}$$

01.24.21.0242.01

$$\int z^n e^{-cz}\coth(cz)\,\text{sech}(cz)\,dz = -\frac{2z^{1+n}}{1+n} - 2\, e^{2cz}\, n!\sum_{j=0}^{n}\frac{(-1)^j 2^{-j-1} c^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(1, \ldots, 1, 1; 2, \ldots, 2; e^{2cz}\right) /;\, n \in \mathbb{N}$$

01.24.21.0243.01

$$\int z^n e^{-cz(2q+1)}\coth(cz)\,\text{sech}(cz)\,dz = 2\,n!\left(-\frac{z^{n+1}}{(n+1)!} + e^{2cz}\sum_{j=0}^{n}\frac{(-2c)^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(1, \ldots, 1, 1; 2, \ldots, 2; e^{2cz}\right) + \sum_{j=0}^{n}\sum_{k=0}^{q-1}\frac{e^{2c(k-q)z}(2c(q-k))^{-j-1} z^{n-j}}{(n-j)!}\right) /;\, n \in \mathbb{N} \land q \in \mathbb{N}^+$$

Involving powers of coth, exp and power

## Involving $z^n\, e^{p z} \coth^u(c z) \operatorname{sech}(c z)$

01.24.21.0244.01

$$\int z^n e^{p z} \coth^u(c z) \operatorname{sech}(c z)\, dz = 2 (-1)^u e^{(p+c u) z} \binom{u-1}{\frac{u-1}{2}} n! \,(1-(u-1) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (p+c u)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{p+c u}{2 c}, \ldots, \frac{p+c u}{2 c}, u; \frac{p+c u}{2 c}+1, \ldots, \frac{p+c u}{2 c}+1; e^{2 c z}\right) + 2 (-1)^u e^{c u z} n! \sum_{k=0}^{\left\lfloor \frac{u-2}{2} \right\rfloor} \binom{u-1}{k} \left(e^{(p-c(-2 k+u-1)) z} \sum_{j=0}^{n} \frac{(-1)^j (c(2 k+1)+p)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c(2 k+1)+p}{2 c}, \ldots, \frac{c(2 k+1)+p}{2 c}, u; \frac{c(2 k+1)+p}{2 c}+1, \ldots, \frac{c(2 k+1)+p}{2 c}+1; e^{2 c z}\right) + e^{(p+c(-2 k+u-1)) z} \sum_{j=0}^{n} \frac{(-1)^j (p+c(-2 k+2 u-1))^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{p+c(-2 k+2 u-1)}{2 c}, \ldots, \frac{p+c(-2 k+2 u-1)}{2 c}, u; \frac{p+c(-2 k+2 u-1)}{2 c}+1, \ldots, \frac{p+c(-2 k+2 u-1)}{2 c}+1; e^{2 c z}\right)\right) /; n \in \mathbb{N} \land u \in \mathbb{N}^+$$

## Involving hyperbolic, exponential and trigonometric functions

### Involving sin, sinh and exp

## Involving $e^{p z} \sin(a z) \sinh(b z) \operatorname{sech}(c z)$

01.24.21.0245.01

$$\int e^{p z} \sin(a z) \sinh(b z) \operatorname{sech}(c z)\, dz = -\frac{1}{2} i \left( \frac{e^{(-b+c-i a+p) z} \, {}_2F_1\left(1, \frac{-b+c-i a+p}{2 c}; \frac{-b+3 c-i a+p}{2 c}; -e^{2 c z}\right)}{-b+c-i a+p} - \frac{e^{(-b+c+i a+p) z} \, {}_2F_1\left(1, \frac{-b+c+i a+p}{2 c}; \frac{-b+3 c+i a+p}{2 c}; -e^{2 c z}\right)}{-b+c+i a+p} - \frac{e^{(b+c-i a+p) z} \, {}_2F_1\left(1, \frac{b+c-i a+p}{2 c}; \frac{b+3 c-i a+p}{2 c}; -e^{2 c z}\right)}{b+c-i a+p} + \frac{e^{(b+c+i a+p) z} \, {}_2F_1\left(1, \frac{b+c+i a+p}{2 c}; \frac{b+3 c+i a+p}{2 c}; -e^{2 c z}\right)}{b+c+i a+p} \right)$$

### Involving powers of sin, powers of sinh and exp

## Involving $e^{p z} \sin^m(a z) \sinh^u(b z) \operatorname{sech}(c z)$

01.24.21.0246.01

$$\int e^{p z} \sin^m(a z) \sinh^u(b z) \operatorname{sech}(c z) \, dz = \frac{i^u 2^{-m-u+1} e^{(c+p) z} (1 - m \bmod 2)(1 - u \bmod 2)}{c+p} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} {}_2F_1\left(\frac{c+p}{2 c}, 1; \frac{3 c+p}{2 c}; -e^{2 c z}\right) +$$

$$i^u 2^{-m-u+1} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left( \frac{e^{(c-2 i a k+i a m+p) z-\frac{i m \pi}{2}} {}_2F_1\left(1, \frac{c-2 i a k+i a m+p}{2 c}; \frac{3 c-2 i a k+i a m+p}{2 c}; -e^{2 c z}\right)}{c-2 i a k+i a m+p} + \frac{e^{\frac{i \pi m}{2}+(c+2 i a k-i a m+p) z} {}_2F_1\left(1, \frac{c+2 i a k-i a m+p}{2 c}; \frac{3 c+2 i a k-i a m+p}{2 c}; -e^{2 c z}\right)}{c+2 i a k-i a m+p} \right) +$$

$$2^{-m-u+1} \binom{m}{\frac{m}{2}} (1 - m \bmod 2) \sum_{j=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^j \binom{u}{j} \left( \frac{e^{(c-2 b j+p+b u) z} {}_2F_1\left(1, \frac{c-2 b j+p+b u}{2 c}; \frac{3 c-2 b j+p+b u}{2 c}; -e^{2 c z}\right)}{c-2 b j+p+b u} + \frac{(-1)^u e^{(c+2 b j+p-b u) z} {}_2F_1\left(1, \frac{c+2 b j+p-b u}{2 c}; \frac{3 c+2 b j+p-b u}{2 c}; -e^{2 c z}\right)}{c+2 b j+p-b u} \right) +$$

$$2^{-m-u+1} \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \sum_{j=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^j \binom{u}{j} \Bigg( \left( e^{(c-2 b j-2 i a k+i a m+p+b u) z-\frac{i \pi m}{2}} {}_2F_1\left(1, \frac{c-2 b j-2 i a k+i a m+p+b u}{2 c}; \frac{3 c-2 b j-2 i a k+i a m+p+b u}{2 c}; -e^{2 c z}\right) \right) \Big/ (c-2 b j-2 i a k+i a m+p+b u) +$$

$$\left( e^{\frac{i \pi m}{2}+(c-2 b j+2 i a k-i a m+p+b u) z} {}_2F_1\left(1, \frac{c-2 b j+2 i a k-i a m+p+b u}{2 c}; \frac{3 c-2 b j+2 i a k-i a m+p+b u}{2 c}; -e^{2 c z}\right) \right) \Big/ (c-2 b j+2 i a k-i a m+p+b u) +$$

$$\left( (-1)^u e^{(c+2 b j-2 i a k+i a m+p-b u) z-\frac{i \pi m}{2}} {}_2F_1\left(1, \frac{c+2 b j-2 i a k+i a m+p-b u}{2 c}; \frac{3 c+2 b j-2 i a k+i a m+p-b u}{2 c}; -e^{2 c z}\right) \right) \Big/ (c+2 b j-2 i a k+i a m+p-b u) +$$

$$\left( (-1)^u e^{\frac{i \pi m}{2}+(c+2 b j+2 i a k-i a m+p-b u) z} {}_2F_1\left(1, \frac{c+2 b j+2 i a k-i a m+p-b u}{2 c}; \frac{3 c+2 b j+2 i a k-i a m+p-b u}{2 c}; -e^{2 c z}\right) \right) \Big/ (c+2 b j+2 i a k-i a m+p-b u) \Bigg) /; m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

## Involving cos, sinh and exp

### Involving $e^{p z} \cos(a z) \sinh(b z) \operatorname{sech}(c z)$

01.24.21.0247.01

$$\int e^{p z} \cos(a z) \sinh(b z) \operatorname{sech}(c z) \, dz = \frac{1}{2} \left( \frac{e^{i\pi + (-b+c-i a+p) z} \, {}_2F_1\left(1, \frac{-b+c-i a+p}{2c}; \frac{-b+3c-i a+p}{2c}; -e^{2 c z}\right)}{-b+c-i a+p} + \frac{e^{i\pi + (-b+c+i a+p) z} \, {}_2F_1\left(1, \frac{-b+c+i a+p}{2c}; \frac{-b+3c+i a+p}{2c}; -e^{2 c z}\right)}{-b+c+i a+p} + \frac{e^{(b+c-i a+p) z} \, {}_2F_1\left(1, \frac{b+c-i a+p}{2c}; \frac{b+3c-i a+p}{2c}; -e^{2 c z}\right)}{b+c-i a+p} + \frac{e^{(b+c+i a+p) z} \, {}_2F_1\left(1, \frac{b+c+i a+p}{2c}; \frac{b+3c+i a+p}{2c}; -e^{2 c z}\right)}{b+c+i a+p} \right)$$

## Involving powers of cos, powers of sinh and exp

### Involving $e^{p z} \cos^m(a z) \sinh^u(b z) \operatorname{sech}(c z)$

01.24.21.0248.01

$$\int e^{p z} \cos^m(a z) \sinh^u(b z) \operatorname{sech}(c z) \, dz = \frac{i^u 2^{-m-u+1} e^{(c+p) z} (1 - m \bmod 2)(1 - u \bmod 2)}{c+p} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} {}_2F_1\left(1, \frac{c+p}{2c}; \frac{1}{2}\left(\frac{p}{c}+3\right); -e^{2 c z}\right) + i^u 2^{-m-u+1} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \left( \frac{e^{(c - i a m + p + 2 i a s) z} {}_2F_1\left(1, \frac{c - i a m + p + 2 i a s}{2c}; \frac{3c - i a m + p + 2 i a s}{2c}; -e^{2 c z}\right)}{c - i a m + p + 2 i a s} + \frac{e^{(c + i a m + p - 2 i a s) z} {}_2F_1\left(1, \frac{c + i a m + p - 2 i a s}{2c}; \frac{3c + i a m + p - 2 i a s}{2c}; -e^{2 c z}\right)}{c + i a m + p - 2 i a s} \right) + 2^{-m-u+1} \binom{m}{\frac{m}{2}} (1 - m \bmod 2) \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{u}{k} \left( \frac{e^{(c - 2 b k + p + b u) z} {}_2F_1\left(1, \frac{c - 2 b k + p + b u}{2c}; \frac{3c - 2 b k + p + b u}{2c}; -e^{2 c z}\right)}{c - 2 b k + p + b u} + \frac{(-1)^u e^{(c + 2 b k + p - b u) z} {}_2F_1\left(1, \frac{c + 2 b k + p - b u}{2c}; \frac{3c + 2 b k + p - b u}{2c}; -e^{2 c z}\right)}{c + 2 b k + p - b u} \right) + 2^{-m-u+1} \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{u}{k} \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \left( \left( e^{(c - 2 b k - i a m + p + 2 i a s + b u) z} {}_2F_1\left(1, \frac{c - 2 b k - i a m + p + 2 i a s + b u}{2c}; \frac{3c - 2 b k - i a m + p + 2 i a s + b u}{2c}; -e^{2 c z}\right) \right) \Big/ (c - 2 b k - i a m + p + 2 i a s + b u) + \left( e^{(c - 2 b k + i a m + p - 2 i a s + b u) z} {}_2F_1\left(1, \frac{c - 2 b k + i a m + p - 2 i a s + b u}{2c}; \frac{3c - 2 b k + i a m + p - 2 i a s + b u}{2c}; -e^{2 c z}\right) \right) \Big/ (c - 2 b k + i a m + p - 2 i a s + b u) + \left( e^{i \pi u + (c + 2 b k - i a m + p + 2 i a s - b u) z} {}_2F_1\left(1, \frac{c + 2 b k - i a m + p + 2 i a s - b u}{2c}; \frac{3c + 2 b k - i a m + p + 2 i a s - b u}{2c}; -e^{2 c z}\right) \right) \Big/ (c + 2 b k - i a m + p + 2 i a s - b u) + \left( e^{i \pi u + (c + 2 b k + i a m + p - 2 i a s - b u) z} {}_2F_1\left(1, \frac{c + 2 b k + i a m + p - 2 i a s - b u}{2c}; \frac{3c + 2 b k + i a m + p - 2 i a s - b u}{2c}; -e^{2 c z}\right) \right) \Big/ (c + 2 b k + i a m + p - 2 i a s - b u) \right) /; m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

## Involving sin, cosh and exp

### Involving $e^{p z} \sin(a z) \cosh(b z) \operatorname{sech}(c z)$

01.24.21.0249.01

$$\int e^{p z} \sin(a z) \cosh(b z) \operatorname{sech}(c z) \, dz = -\frac{1}{2} i \left( \frac{e^{i \pi + (-b+c-i a+p) z} \, {}_2F_1\left(1, \frac{-b+c-i a+p}{2 c}; \frac{-b+3 c-i a+p}{2 c}; -e^{2 c z}\right)}{-b+c-i a+p} + \frac{e^{(-b+c+i a+p) z} \, {}_2F_1\left(1, \frac{-b+c+i a+p}{2 c}; \frac{-b+3 c+i a+p}{2 c}; -e^{2 c z}\right)}{-b+c+i a+p} + \frac{e^{i \pi + (b+c-i a+p) z} \, {}_2F_1\left(1, \frac{b+c-i a+p}{2 c}; \frac{b+3 c-i a+p}{2 c}; -e^{2 c z}\right)}{b+c-i a+p} + \frac{e^{(b+c+i a+p) z} \, {}_2F_1\left(1, \frac{b+c+i a+p}{2 c}; \frac{b+3 c+i a+p}{2 c}; -e^{2 c z}\right)}{b+c+i a+p} \right)$$

## Involving powers of sin, powers of cosh and exp

### Involving $e^{p z} \sin^m(a z) \cosh^u(b z) \operatorname{sech}(c z)$

01.24.21.0250.01

$$\begin{aligned}
&\int e^{p z} \sin^m(a z) \cosh^u(b z) \operatorname{sech}(c z)\, dz = \\
&\frac{2^{-m-u+1} e^{(c+p) z} (1 - m \bmod 2)(1 - u \bmod 2)}{c+p} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} {}_2F_1\left(1, \frac{c+p}{2c}; \frac{1}{2}\left(\frac{p}{c}+3\right); -e^{2 c z}\right) + \\
&2^{-m-u+1} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left( \frac{e^{(c-2 i a k+i a m+p) z-\frac{i m \pi}{2}} {}_2F_1\left(1, \frac{c-2 i a k+i a m+p}{2c}; \frac{3c-2 i a k+i a m+p}{2c}; -e^{2 c z}\right)}{c-2 i a k+i a m+p} + \right. \\
&\left. \frac{e^{\frac{i \pi m}{2}+(c+2 i a k-i a m+p) z} {}_2F_1\left(1, \frac{c+2 i a k-i a m+p}{2c}; \frac{3c+2 i a k-i a m+p}{2c}; -e^{2 c z}\right)}{c+2 i a k-i a m+p} \right) + \\
&2^{-m-u+1} \binom{m}{\frac{m}{2}} (1 - m \bmod 2) \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left( \frac{e^{(c+p-2 b s+b u) z} {}_2F_1\left(1, \frac{c+p-2 b s+b u}{2c}; \frac{3c+p-2 b s+b u}{2c}; -e^{2 c z}\right)}{c+p-2 b s+b u} + \right. \\
&\left. \frac{e^{(c+p+2 b s-b u) z} {}_2F_1\left(1, \frac{c+p+2 b s-b u}{2c}; \frac{3c+p+2 b s-b u}{2c}; -e^{2 c z}\right)}{c+p+2 b s-b u} \right) + 2^{-m-u+1} i^{-m} \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \\
&\sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left( \left( e^{(c-2 i a k+i a m+p-2 b s+b u) z} {}_2F_1\left(1, \frac{c-2 i a k+i a m+p-2 b s+b u}{2c}; \frac{3c-2 i a k+i a m+p-2 b s+b u}{2c}; \right.\right.\right. \\
&\left.\left. -e^{2 c z}\right)\right) \Big/ (c-2 i a k+i a m+p-2 b s+b u) + \left( e^{i \pi m+(c+2 i a k-i a m+p-2 b s+b u) z} \right. \\
&\left. {}_2F_1\left(1, \frac{c+2 i a k-i a m+p-2 b s+b u}{2c}; \frac{3c+2 i a k-i a m+p-2 b s+b u}{2c}; -e^{2 c z}\right)\right) \Big/ \\
&(c+2 i a k-i a m+p-2 b s+b u) + \left( e^{(c-2 i a k+i a m+p+2 b s-b u) z} {}_2F_1\left(1, \frac{c-2 i a k+i a m+p+2 b s-b u}{2c}; \right.\right. \\
&\left.\left. \frac{3c-2 i a k+i a m+p+2 b s-b u}{2c}; -e^{2 c z}\right)\right) \Big/ (c-2 i a k+i a m+p+2 b s-b u) + \\
&\left( e^{i \pi m+(c+2 i a k-i a m+p+2 b s-b u) z} {}_2F_1\left(1, \frac{c+2 i a k-i a m+p+2 b s-b u}{2c}; \frac{3c+2 i a k-i a m+p+2 b s-b u}{2c}; \right.\right. \\
&\left.\left.\left. -e^{2 c z}\right)\right) \Big/ (c+2 i a k-i a m+p+2 b s-b u) \right) \text{/; } m \in \mathbb{N}^+ \land u \in \mathbb{N}^+
\end{aligned}$$

## Involving cos, cosh and exp

### Involving $e^{p z} \cos(a z) \cosh(b z) \operatorname{sech}(c z)$

01.24.21.0251.01

$$\int e^{p z} \cos(a z) \cosh(b z) \operatorname{sech}(c z) \, dz = \frac{1}{2} \left( \frac{e^{(-b+c-i a+p) z}}{-b+c-i a+p} \, {}_2F_1\left(1, \frac{-b+c-i a+p}{2 c}; \frac{-b+3 c-i a+p}{2 c}; -e^{2 c z}\right) + \frac{e^{(-b+c+i a+p) z}}{-b+c+i a+p} \, {}_2F_1\left(1, \frac{-b+c+i a+p}{2 c}; \frac{-b+3 c+i a+p}{2 c}; -e^{2 c z}\right) + \frac{e^{(b+c-i a+p) z}}{b+c-i a+p} \, {}_2F_1\left(1, \frac{b+c-i a+p}{2 c}; \frac{b+3 c-i a+p}{2 c}; -e^{2 c z}\right) + \frac{e^{(b+c+i a+p) z}}{b+c+i a+p} \, {}_2F_1\left(1, \frac{b+c+i a+p}{2 c}; \frac{b+3 c+i a+p}{2 c}; -e^{2 c z}\right) \right)$$

## Involving powers of cos, powers of cosh and exp

### Involving $e^{p z} \cos^m(a z) \cosh^u(b z) \operatorname{sech}(c z)$

01.24.21.0252.01

$$\int e^{pz}\cos^m(az)\cosh^u(bz)\operatorname{sech}(cz)\,dz = \frac{2^{-m-u+1}e^{(c+p)z}(1-m \bmod 2)(1-u \bmod 2)}{c+p}\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}\,{}_2F_1\left(1,\frac{c+p}{2c};\frac{1}{2}\left(\frac{p}{c}+3\right);-e^{2cz}\right)+ 2^{-m-u+1}\binom{u}{\frac{u}{2}}(1-u \bmod 2)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\left(\frac{e^{(c-2iak+iam+p)z}\,{}_2F_1\left(1,\frac{c-2iak+iam+p}{2c};\frac{3c-2iak+iam+p}{2c};-e^{2cz}\right)}{c-2iak+iam+p}+\frac{e^{(c+2iak-iam+p)z}\,{}_2F_1\left(1,\frac{c+2iak-iam+p}{2c};\frac{3c+2iak-iam+p}{2c};-e^{2cz}\right)}{c+2iak-iam+p}\right)+ 2^{-m-u+1}\binom{m}{\frac{m}{2}}(1-m \bmod 2)\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(\frac{e^{(c+p-2bs+bu)z}\,{}_2F_1\left(1,\frac{c+p-2bs+bu}{2c};\frac{3c+p-2bs+bu}{2c};-e^{2cz}\right)}{c+p-2bs+bu}+\frac{e^{(c+p+2bs-bu)z}\,{}_2F_1\left(1,\frac{c+p+2bs-bu}{2c};\frac{3c+p+2bs-bu}{2c};-e^{2cz}\right)}{c+p+2bs-bu}\right)+2^{-m-u+1}\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(\left(e^{(c-2iak+iam+p-2bs+bu)z}\,{}_2F_1\left(1,\frac{c-2iak+iam+p-2bs+bu}{2c};\frac{3c-2iak+iam+p-2bs+bu}{2c};-e^{2cz}\right)\right)\Big/(c-2iak+iam+p-2bs+bu)+\left(e^{(c+2iak-iam+p-2bs+bu)z}\,{}_2F_1\left(1,\frac{c+2iak-iam+p-2bs+bu}{2c};\frac{3c+2iak-iam+p-2bs+bu}{2c};-e^{2cz}\right)\right)\Big/(c+2iak-iam+p-2bs+bu)+\left(e^{(c-2iak+iam+p+2bs-bu)z}\,{}_2F_1\left(1,\frac{c-2iak+iam+p+2bs-bu}{2c};\frac{3c-2iak+iam+p+2bs-bu}{2c};-e^{2cz}\right)\right)\Big/(c-2iak+iam+p+2bs-bu)+\left(e^{(c+2iak-iam+p+2bs-bu)z}\,{}_2F_1\left(1,\frac{c+2iak-iam+p+2bs-bu}{2c};\frac{3c+2iak-iam+p+2bs-bu}{2c};-e^{2cz}\right)\right)\Big/(c+2iak-iam+p+2bs-bu)\right)\ /;\ m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

## Involving sin, tanh and exp

### Involving $e^{pz}\sin(az)\tanh(cz)\operatorname{sech}(cz)$

01.24.21.0253.01

$$\int e^{p z} \sin(a z) \tanh(c z) \operatorname{sech}(c z)\, dz = e^{2 c z} \left( -\frac{e^{-\frac{1}{2}(i \pi)+(-c+i a+p) z}\, {}_2F_1\left(2, \frac{1}{2}+\frac{i a}{2 c}+\frac{p}{2 c}; \frac{3}{2}+\frac{i a}{2 c}+\frac{p}{2 c}; -e^{2 c z}\right)}{c+i a+p} + \frac{e^{-\frac{1}{2}(i \pi)+(c+i a+p) z}\, {}_2F_1\left(2, \frac{3}{2}+\frac{i a}{2 c}+\frac{p}{2 c}; \frac{5}{2}+\frac{i a}{2 c}+\frac{p}{2 c}; -e^{2 c z}\right)}{3 c+i a+p} - \frac{e^{\frac{i \pi}{2}+(-c-i a+p) z}\, {}_2F_1\left(2, \frac{1}{2}-\frac{i a}{2 c}+\frac{p}{2 c}; \frac{3}{2}-\frac{i a}{2 c}+\frac{p}{2 c}; -e^{2 c z}\right)}{c-i a+p} + \frac{e^{\frac{i \pi}{2}+(c-i a+p) z}\, {}_2F_1\left(2, \frac{3}{2}-\frac{i a}{2 c}+\frac{p}{2 c}; \frac{5}{2}-\frac{i a}{2 c}+\frac{p}{2 c}; -e^{2 c z}\right)}{3 c-i a+p} \right)$$

## Involving powers of sin, powers of tanh and exp

### Involving $e^{p z} \sin^m(a z) \tanh^\mu(c z) \operatorname{sech}(c z)$

01.24.21.0254.01

$$\int e^{p z} \sin^m(a z) \tanh^\mu(c z) \operatorname{sech}(c z)\, dz = 2^{1-m} e^{-c z} \left(1+e^{-2 c z}\right)^\mu \tanh^\mu(c z) \left(1-e^{-2 c z}\right)^{-\mu} \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left( \frac{e^{\frac{i \pi m}{2}+(p-i a (m-2 k)) z}}{-c-i a (m-2 k)+p} F_1\left(\frac{c+a i (m-2 k)-p}{2 c}; \mu+1, -\mu; \frac{1}{2}\left(3-\frac{p-i a (m-2 k)}{c}\right); -e^{-2 c z}, e^{-2 c z}\right) + \frac{e^{(a i (m-2 k)+p) z-\frac{i m \pi}{2}}}{-c+a i (m-2 k)+p} F_1\left(-\frac{-c+a i (m-2 k)+p}{2 c}; \mu+1, -\mu; \frac{1}{2}\left(3-\frac{a i (m-2 k)+p}{c}\right); -e^{-2 c z}, e^{-2 c z}\right) \right) + \frac{1}{p-c} 2^{1-m} e^{(p-c) z} \left(1-e^{-2 c z}\right)^{-\mu} \left(1+e^{-2 c z}\right)^\mu F_1\left(\frac{c-p}{2 c}; \mu+1, -\mu; \frac{1}{2}\left(3-\frac{p}{c}\right); -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} (1-m \bmod 2) \tanh^\mu(c z) \;/;\; m \in \mathbb{N}^+$$

01.24.21.0255.01

$$\int e^{pz}\sin^m(az)\tanh^u(cz)\operatorname{sech}(cz)\,dz = \frac{1}{p+c(u+1)}\left(i^u\,2^{1-m}\,e^{((u+1)c+p)z}\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}\,{}_2F_1\!\left(\frac{p}{2c}+\frac{u}{2}+\frac{1}{2},u+1;\frac{p}{2c}+\frac{u}{2}+\frac{3}{2};-e^{2cz}\right)(1-m\bmod 2)(1-u\bmod 2)\right)+$$

$$i^{m+u}\,2^{1-m}\,e^{c(u+1)z}\binom{u}{\frac{u}{2}}(1-u\bmod 2)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}$$

$$\left(\left((-1)^m e^{(ai(m-2k)+p)z}\,{}_2F_1\!\left(-\frac{iak}{c}+\frac{iam}{2c}+\frac{p}{2c}+\frac{u}{2}+\frac{1}{2},u+1;-\frac{iak}{c}+\frac{iam}{2c}+\frac{p}{2c}+\frac{u}{2}+\frac{3}{2};-e^{2cz}\right)\right)\Big/\right.$$

$$(ai(m-2k)+p+c(u+1))+\left(e^{(p-ia(m-2k))z}\,{}_2F_1\!\left(\frac{iak}{c}+\frac{p}{2c}+\frac{u}{2}+\frac{1}{2}-\frac{iam}{2c},\right.\right.$$

$$\left.\left.\left.u+1;\frac{iak}{c}+\frac{p}{2c}+\frac{u}{2}+\frac{3}{2}-\frac{iam}{2c};-e^{2cz}\right)\right)\Big/(ai(2k-m)+p+c(u+1))\right)+$$

$$2^{1-m}\,e^{c(u+1)z}\binom{m}{\frac{m}{2}}(1-m\bmod 2)\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}\left(\frac{(-1)^u e^{(p-c(u-2s))z}\,{}_2F_1\!\left(\frac{p}{2c}+s+\frac{1}{2},u+1;\frac{p}{2c}+s+\frac{3}{2};-e^{2cz}\right)}{p+c(2s+1)}+\right.$$

$$\left.\frac{e^{(p+c(u-2s))z}\,{}_2F_1\!\left(u+1,\frac{p}{2c}-s+u+\frac{1}{2};\frac{p}{2c}-s+u+\frac{3}{2};-e^{2cz}\right)}{p+c(-2s+2u+1)}\right)+2^{1-m}\,e^{c(u+1)z}$$

$$\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}\left(\left((-1)^u e^{(ai(m-2k)+p-c(u-2s))z-\frac{im\pi}{2}}\,{}_2F_1\!\left(-\frac{iak}{c}+\frac{iam}{2c}+\frac{p}{2c}+s+\frac{1}{2},u+1;-\frac{iak}{c}+\right.\right.\right.$$

$$\left.\left.\frac{iam}{2c}+\frac{p}{2c}+s+\frac{3}{2};-e^{2cz}\right)\right)\Big/(2sc+c-2iak+iam+p)+\left((-1)^u e^{\frac{i\pi m}{2}+(-ia(m-2k)+p-c(u-2s))z}\right.$$

$$\left.{}_2F_1\!\left(\frac{iak}{c}+\frac{p}{2c}+s+\frac{1}{2}-\frac{iam}{2c},u+1;\frac{iak}{c}+\frac{p}{2c}+s+\frac{3}{2}-\frac{iam}{2c};-e^{2cz}\right)\right)\Big/$$

$$(2sc+c+2iak-iam+p)+\left(e^{(ai(m-2k)+p+c(u-2s))z-\frac{im\pi}{2}}\,{}_2F_1\!\left(u+1,-\frac{iak}{c}+\frac{iam}{2c}+\frac{p}{2c}-\right.\right.$$

$$\left.\left.s+u+\frac{1}{2};-\frac{iak}{c}+\frac{iam}{2c}+\frac{p}{2c}-s+u+\frac{3}{2};-e^{2cz}\right)\right)\Big/(ai(m-2k)+p+c(-2s+2u+1))+$$

$$\left(e^{\frac{i\pi m}{2}+(-ia(m-2k)+p+c(u-2s))z}\,{}_2F_1\!\left(u+1,\frac{iak}{c}+\frac{p}{2c}-s+u+\frac{1}{2}-\frac{iam}{2c};\frac{iak}{c}+\frac{p}{2c}-s+u+\right.\right.$$

$$\left.\left.\left.\frac{3}{2}-\frac{iam}{2c};-e^{2cz}\right)\right)\Big/(ai(2k-m)+p+c(-2s+2u+1))\right)\;/;\;m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

## Involving cos, tanh and exp

### Involving $e^{pz}\cos(az)\tanh(cz)\operatorname{sech}(cz)$

01.24.21.0256.01

$$\int e^{pz}\cos(az)\tanh(cz)\operatorname{sech}(cz)\,dz = e^{2cz}\left(-\frac{e^{(-c+ia+p)z}\,{}_2F_1\left(2,\frac{1}{2}+\frac{ia}{2c}+\frac{p}{2c};\frac{3}{2}+\frac{ia}{2c}+\frac{p}{2c};-e^{2cz}\right)}{c+ia+p}+\frac{e^{(c+ia+p)z}\,{}_2F_1\left(2,\frac{3}{2}+\frac{ia}{2c}+\frac{p}{2c};\frac{5}{2}+\frac{ia}{2c}+\frac{p}{2c};-e^{2cz}\right)}{3c+ia+p}-\frac{e^{(-c-ia+p)z}\,{}_2F_1\left(2,\frac{1}{2}-\frac{ia}{2c}+\frac{p}{2c};\frac{3}{2}-\frac{ia}{2c}+\frac{p}{2c};-e^{2cz}\right)}{c-ia+p}+\frac{e^{(c-ia+p)z}\,{}_2F_1\left(2,\frac{3}{2}-\frac{ia}{2c}+\frac{p}{2c};\frac{5}{2}-\frac{ia}{2c}+\frac{p}{2c};-e^{2cz}\right)}{3c-ia+p}\right)$$

## Involving powers of cos, powers of tanh and exp

### Involving $e^{pz}\cos^m(az)\tanh^{\mu}(cz)\operatorname{sech}(cz)$

01.24.21.0257.01

$$\int e^{pz}\cos^m(az)\tanh^{\mu}(cz)\operatorname{sech}(cz)\,dz = 2^{1-m}e^{-cz}\left(1+e^{-2cz}\right)^{\mu}\tanh^{\mu}(cz)\left(1-e^{-2cz}\right)^{-\mu}\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\left(\frac{e^{(ai(m-2k)+p)z}}{-c+ai(m-2k)+p}F_1\left(-\frac{-c+ai(m-2k)+p}{2c};\mu+1,-\mu;\frac{1}{2}\left(3-\frac{ai(m-2k)+p}{c}\right);-e^{-2cz},e^{-2cz}\right)+\frac{e^{(p-ia(m-2k))z}}{-c-ia(m-2k)+p}F_1\left(-\frac{-c-ia(m-2k)+p}{2c};\mu+1,-\mu;\frac{1}{2}\left(3-\frac{p-ia(m-2k)}{c}\right);-e^{-2cz},e^{-2cz}\right)\right)+\frac{1}{p-c}2^{1-m}e^{(p-c)z}\left(1-e^{-2cz}\right)^{-\mu}\left(1+e^{-2cz}\right)^{\mu}F_1\left(-\frac{p-c}{2c};\mu+1,-\mu;\frac{1}{2}\left(3-\frac{p}{c}\right);-e^{-2cz},e^{-2cz}\right)\binom{m}{\frac{m}{2}}(1-m\bmod 2)\tanh^{\mu}(cz)\;/;\;m\in\mathbb{N}^+$$

01.24.21.0258.01

$$\int e^{pz}\cos^m(az)\tanh^u(cz)\operatorname{sech}(cz)\,dz = \frac{1}{p+c(u+1)}\left(i^u 2^{1-m} e^{((u+1)c+p)z}\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}\,{}_2F_1\left(\frac{p}{2c}+\frac{u}{2}+\frac{1}{2},u+1;\frac{p}{2c}+\frac{u}{2}+\frac{3}{2};-e^{2cz}\right)(1-m\bmod 2)(1-u\bmod 2)\right)-$$

$$i^u 2^{1-m} e^{c(u+1)z}\binom{u}{\frac{u}{2}}(u\bmod 2-1)$$

$$\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(\left(e^{(p-ia(m-2s))z}\,{}_2F_1\left(-\frac{iam}{2c}+\frac{p}{2c}+\frac{ias}{c}+\frac{u}{2}+\frac{1}{2},u+1;-\frac{iam}{2c}+\frac{p}{2c}+\frac{ias}{c}+\frac{u}{2}+\frac{3}{2};-e^{2cz}\right)\right)\Big/\right.$$

$$(p-ia(m-2s)+c(u+1))+\left(e^{(p+ai(m-2s))z}\,{}_2F_1\left(\frac{iam}{2c}+\frac{p}{2c}+\frac{u}{2}+\frac{1}{2}-\frac{ias}{c},\right.\right.$$

$$\left.\left.\left.u+1;\frac{iam}{2c}+\frac{p}{2c}+\frac{u}{2}+\frac{3}{2}-\frac{ias}{c};-e^{2cz}\right)\right)\Big/(p+ai(m-2s)+c(u+1))\right)+$$

$$2^{1-m}e^{c(u+1)z}\binom{m}{\frac{m}{2}}(1-m\bmod 2)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\left(\frac{(-1)^u e^{(p-c(u-2k))z}\,{}_2F_1\left(k+\frac{p}{2c}+\frac{1}{2},u+1;k+\frac{p}{2c}+\frac{3}{2};-e^{2cz}\right)}{c(2k+1)+p}+\right.$$

$$\left.\frac{e^{(p+c(u-2k))z}\,{}_2F_1\left(u+1,-k+\frac{p}{2c}+u+\frac{1}{2};-k+\frac{p}{2c}+u+\frac{3}{2};-e^{2cz}\right)}{p+c(-2k+2u+1)}\right)+$$

$$2^{1-m}e^{c(u+1)z}\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{s}\binom{u}{k}\left(\left((-1)^u e^{(p-ia(m-2s)-c(u-2k))z}\,{}_2F_1\left(k+\frac{p}{2c}+\frac{ias}{c}+\frac{1}{2}-\frac{iam}{2c},\right.\right.\right.$$

$$\left.\left.u+1;k+\frac{p}{2c}+\frac{ias}{c}+\frac{3}{2}-\frac{iam}{2c};-e^{2cz}\right)\right)\Big/(c(2k+1)+p-ia(m-2s))+$$

$$\left((-1)^u e^{(p+ai(m-2s)-c(u-2k))z}\,{}_2F_1\left(k+\frac{iam}{2c}+\frac{p}{2c}+\frac{1}{2}-\frac{ias}{c},u+1;k+\frac{iam}{2c}+\frac{p}{2c}+\frac{3}{2}-\frac{ias}{c};-e^{2cz}\right)\right)\Big/$$

$$(c(2k+1)+p+ai(m-2s))+\left(e^{(p-ia(m-2s)+c(u-2k))z}\,{}_2F_1\left(u+1,-k+\frac{p}{2c}+\frac{ias}{c}+u+\frac{1}{2}-\frac{iam}{2c};\right.\right.$$

$$\left.\left.-k+\frac{p}{2c}+\frac{ias}{c}+u+\frac{3}{2}-\frac{iam}{2c};-e^{2cz}\right)\right)\Big/(p-ia(m-2s)+c(-2k+2u+1))+$$

$$\left(e^{(p+ai(m-2s)+c(u-2k))z}\,{}_2F_1\left(u+1,-k+\frac{iam}{2c}+\frac{p}{2c}+u+\frac{1}{2}-\frac{ias}{c};-k+\frac{iam}{2c}+\frac{p}{2c}+u+\frac{3}{2}-\frac{ias}{c};\right.\right.$$

$$\left.\left.\left.-e^{2cz}\right)\right)\Big/(p+ai(m-2s)+c(-2k+2u+1))\right)\ /;\ m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

## Involving sin, coth and exp

### Involving $e^{pz}\sin(az)\coth(cz)\operatorname{sech}(cz)$

01.24.21.0259.01

$$\int e^{p z} \sin(a z) \coth(c z) \operatorname{sech}(c z) \, dz = i e^{-c z} \left( \frac{e^{(-i a+p) z}}{-c - i a + p} {}_2F_1\left(\frac{c + i a - p}{2 c}, 1; \frac{1}{2} \left(\frac{i a - p}{c} + 3\right); e^{-2 c z}\right) + \frac{e^{(i a+p) z}}{c - i a - p} {}_2F_1\left(-\frac{-c + i a + p}{2 c}, 1; \frac{1}{2} \left(3 - \frac{i a + p}{c}\right); e^{-2 c z}\right)\right)$$

Involving powers of sin, powers of coth and exp

## Involving $e^{p z} \sin^m(a z) \coth^\mu(c z) \operatorname{sech}(c z)$

01.24.21.0260.01

$$\int e^{p z} \sin^m(a z) \coth^\mu(c z) \operatorname{sech}(c z) \, dz = 2^{1-m} e^{-c z} \left(1 - e^{-2 c z}\right)^\mu \coth^\mu(c z) \left( \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left( \frac{1}{-c + a i (m - 2 k) + p} \left( e^{(a i (m-2 k)+p) z - \frac{i m \pi}{2}} F_1\left(-\frac{-c + a i (m - 2 k) + p}{2 c}; 1 - \mu, \mu; \frac{1}{2} \left(3 - \frac{a i (m - 2 k) + p}{c}\right); -e^{-2 c z}, e^{-2 c z}\right)\right) + \frac{1}{-c - i a (m - 2 k) + p} \left( e^{\frac{i \pi m}{2} + (p - i a (m-2 k)) z} F_1\left(-\frac{-c - i a (m - 2 k) + p}{2 c}; 1 - \mu, \mu; \frac{1}{2} \left(3 - \frac{p - i a (m - 2 k)}{c}\right); -e^{-2 c z}, e^{-2 c z}\right)\right)\right)\right) \left(1 + e^{-2 c z}\right)^{-\mu} + \frac{1}{p - c} \left( 2^{1-m} e^{(p-c) z} \left(1 - e^{-2 c z}\right)^\mu \left(1 + e^{-2 c z}\right)^{-\mu} F_1\left(-\frac{p - c}{2 c}; 1 - \mu, \mu; \frac{1}{2} \left(3 - \frac{p}{c}\right); -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} \coth^\mu(c z) (1 - m \bmod 2)\right) /; m \in \mathbb{N}^+$$

Involving cos, coth and exp

## Involving $e^{p z} \cos(a z) \coth(c z) \operatorname{sech}(c z)$

01.24.21.0261.01

$$\int e^{p z} \cos(a z) \coth(c z) \operatorname{sech}(c z) \, dz = e^{-c z} \left( \frac{e^{(-i a+p) z} {}_2F_1\left(\frac{c+i a-p}{2 c}, 1; \frac{1}{2} \left(\frac{i a-p}{c} + 3\right); e^{-2 c z}\right)}{-c - i a + p} + \frac{e^{(i a+p) z} {}_2F_1\left(-\frac{-c+i a+p}{2 c}, 1; \frac{1}{2} \left(3 - \frac{i a+p}{c}\right); e^{-2 c z}\right)}{-c + i a + p}\right)$$

Involving powers of cos, powers of coth and exp

## Involving $e^{p z} \cos^m(a z) \coth^\mu(c z) \operatorname{sech}(c z)$

01.24.21.0262.01

$$\int e^{p z} \cos^m(a z) \coth^\mu(c z) \operatorname{sech}(c z)\, dz = 2^{1-m} e^{-c z} \left(1 - e^{-2 c z}\right)^\mu \coth^\mu(c z) \left(\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \left( \left( e^{(a i (m-2k)+p) z} F_1\left(-\frac{-c + a i (m-2k) + p}{2c}; 1-\mu, \mu; \frac{1}{2}\left(3 - \frac{a i (m-2k)+p}{c}\right); -e^{-2 c z}, e^{-2 c z}\right)\right) \Big/ (-c + a i (m-2k) + p) + \left( e^{(p - i a (m-2k)) z} F_1\left(-\frac{-c - i a (m-2k) + p}{2c}; 1-\mu, \mu; \frac{1}{2}\left(3 - \frac{p - i a (m-2k)}{c}\right); -e^{-2 c z}, e^{-2 c z}\right)\right) \Big/ (-c - i a (m-2k) + p)\right) \binom{m}{k} \right) \left(1 + e^{-2 c z}\right)^{-\mu} + \frac{1}{p-c} \left(2^{1-m} e^{(p-c) z} \left(1 - e^{-2 c z}\right)^\mu \left(1 + e^{-2 c z}\right)^{-\mu} F_1\left(-\frac{p-c}{2c}; 1-\mu, \mu; \frac{1}{2}\left(3 - \frac{p}{c}\right); -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} \coth^\mu(c z) (1 - m \bmod 2)\right) /; m \in \mathbb{N}^+$$

## Involving sin, csch and exp

### Involving $e^{p z} \sin(a z) \operatorname{csch}(c z) \operatorname{sech}(c z)$

01.24.21.0263.01

$$\int e^{p z} \sin(a z) \operatorname{csch}(c z) \operatorname{sech}(c z)\, dz = -2 i e^{-2 c z} \left( \frac{e^{(-i a + p) z} {}_2F_1\left(1, \frac{1}{2} + \frac{i a}{4c} - \frac{p}{4c}; \frac{3}{2} + \frac{i a}{4c} - \frac{p}{4c}; e^{-4 c z}\right)}{2c + i a - p} + \frac{e^{(i a + p) z} {}_2F_1\left(1, \frac{1}{2} - \frac{i a}{4c} - \frac{p}{4c}; \frac{3}{2} - \frac{i a}{4c} - \frac{p}{4c}; e^{-4 c z}\right)}{-2c + i a + p} \right)$$

## Involving powers of sin, powers of csch and exp

### Involving $e^{p z} \sin^m(a z) \operatorname{csch}^\mu(c z) \operatorname{sech}(c z)$

01.24.21.0264.01

$$\int e^{p z} \sin^m(a z) \operatorname{csch}^\mu(c z) \operatorname{sech}(c z)\, dz = 2^{1-m} e^{-c z} \left(1 - e^{-2 c z}\right)^\mu \left(\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \left(\left(e^{(a i (m-2k)+p) z - \frac{i m \pi}{2}} F_1\left(\frac{-i a (m-2k) - p + c(\mu+1)}{2c}; 1, \mu; \frac{-i a (m-2k) - p + c(\mu+3)}{2c}; -e^{-2 c z}, e^{-2 c z}\right)\right) \Big/ (a i (m-2k) + p - c(\mu+1)) + \left(e^{\frac{i \pi m}{2} + (p - i a (m-2k)) z} F_1\left(\frac{a i (m-2k) - p + c(\mu+1)}{2c}; 1, \mu; \frac{a i (m-2k) - p + c(\mu+3)}{2c}; -e^{-2 c z}, e^{-2 c z}\right)\right) \Big/ (-i a (m-2k) + p - c(\mu+1))\right) \binom{m}{k} \right) \operatorname{csch}^\mu(c z) + \frac{1}{p - c(\mu+1)} \left(2^{1-m} e^{(p-c) z} \left(1 - e^{-2 c z}\right)^\mu F_1\left(\frac{c(\mu+1) - p}{2c}; 1, \mu; \frac{c(\mu+3) - p}{2c}; -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} \operatorname{csch}^\mu(c z) (1 - m \bmod 2)\right) /; m \in \mathbb{N}^+$$

Involving cos, csch and exp

## Involving $e^{p z} \cos(a z) \operatorname{csch}(c z) \operatorname{sech}(c z)$

01.24.21.0265.01

$$\int e^{p z} \cos(a z) \operatorname{csch}(c z) \operatorname{sech}(c z)\, dz = 2 e^{-2 c z} \left(\frac{e^{(-i a + p) z} {}_2F_1\left(1, \frac{1}{2} + \frac{i a}{4 c} - \frac{p}{4 c}; \frac{3}{2} + \frac{i a}{4 c} - \frac{p}{4 c}; e^{-4 c z}\right)}{-2 c - i a + p} + \frac{e^{(i a + p) z} {}_2F_1\left(1, \frac{1}{2} - \frac{i a}{4 c} - \frac{p}{4 c}; \frac{3}{2} - \frac{i a}{4 c} - \frac{p}{4 c}; e^{-4 c z}\right)}{-2 c + i a + p}\right)$$

Involving powers of cos, powers of csch and exp

## Involving $e^{p z} \cos^m(a z) \operatorname{csch}^\mu(c z) \operatorname{sech}(c z)$

01.24.21.0266.01

$$\int e^{p z} \cos^m(a z) \operatorname{csch}^\mu(c z) \operatorname{sech}(c z)\, dz = 2^{1-m} e^{-c z} \left(1 - e^{-2 c z}\right)^\mu \left(\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \left(\left(e^{(a i (m-2k)+p) z} F_1\left(\frac{-i a (m-2k) - p + c(\mu+1)}{2c}; 1, \mu; \frac{-i a (m-2k) - p + c(\mu+3)}{2c}; -e^{-2 c z}, e^{-2 c z}\right)\right) \Big/ \left(a i (m-2k) + p - c(\mu+1)\right) + \frac{e^{(p - i a (m-2k)) z} F_1\left(\frac{a i (m-2k) - p + c(\mu+1)}{2c}; 1, \mu; \frac{a i (m-2k) - p + c(\mu+3)}{2c}; -e^{-2 c z}, e^{-2 c z}\right)}{-i a (m-2k) + p - c(\mu+1)}\right) \binom{m}{k}\right) \operatorname{csch}^\mu(c z) + \frac{1}{p - c(\mu+1)} \left(2^{1-m} e^{(p-c) z} \left(1 - e^{-2 c z}\right)^\mu F_1\left(\frac{c(\mu+1) - p}{2c}; 1, \mu; \frac{c(\mu+3) - p}{2c}; -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} \operatorname{csch}^\mu(c z) (1 - m \bmod 2)\right) /; m \in \mathbb{N}^+$$

## Involving hyperbolic, trigonometric and a power functions

### Involving sin, sinh and power

### Involving $z^n \sin(a z) \sinh(b z) \operatorname{sech}(c z)$

01.24.21.0267.01

$$\int z^n \sin(a z) \sinh(b z) \operatorname{sech}(c z)\, dz = \frac{1}{2} e^{c z} n! \left(-e^{\frac{i \pi}{2} + (-b - i a) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-b - i a + c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c - i a - b}{2c}, \ldots, \frac{c - i a - b}{2c}, 1; \frac{c - i a - b}{2c} + 1, \ldots, \frac{c - i a - b}{2c} + 1; -e^{2 c z}\right) + e^{-\frac{1}{2}(i \pi) + (b + i a) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b + i a + c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c + i a + b}{2c}, \ldots, \frac{c + i a + b}{2c}, 1; \frac{c + i a + b}{2c} + 1, \ldots, \frac{c + i a + b}{2c} + 1; -e^{2 c z}\right) - e^{-\frac{1}{2}(i \pi) + (b - i a) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b - i a + c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c - i a + b}{2c}, \ldots, \frac{c - i a + b}{2c}, 1; \frac{c - i a + b}{2c} + 1, \ldots, \frac{c - i a + b}{2c} + 1; -e^{2 c z}\right) + e^{\frac{i \pi}{2} + (-b + i a) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-b + i a + c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c + i a - b}{2c}, \ldots, \frac{c + i a - b}{2c}, 1; \frac{c + i a - b}{2c} + 1, \ldots, \frac{c + i a - b}{2c} + 1; -e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

### Involving powers of sin, powers of sinh and power

## Involving $z^n \sin^m(a z) \sinh^u(b z) \operatorname{sech}(c z)$

01.24.21.0268.01

$$\int z^n \sin^m(a z) \sinh^u(b z) \operatorname{sech}(c z)\, dz = i^u 2^{-m-u+1} e^{c z} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! (1 - m \bmod 2)(1 - u \bmod 2) \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} c^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{1}{2}, \ldots, \frac{1}{2}, 1; \frac{3}{2}, \ldots, \frac{3}{2}; -e^{2 c z}\right) +$$

$$2^{-m-u+1} i^{m+u} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) n! e^{c z} \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left( e^{(-i a (m-2k)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c + a i (2k - m))^{-j-1}\right)}{(n-j)!} \right.$$

$${}_{j+2}F_{j+1}\left(\frac{c + i a (2k - m)}{2c}, \ldots, \frac{c + i a (2k - m)}{2c}, 1; \frac{c + i a (2k - m)}{2c} + 1, \ldots, \frac{c + i a (2k - m)}{2c} + 1; -e^{2 c z}\right) +$$

$$(-1)^m e^{(i a (m-2k)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c + a i (m - 2k))^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c + i a (m - 2k)}{2c}, \ldots, \right.$$

$$\left.\left. \frac{c + i a (m - 2k)}{2c}, 1; \frac{c + i a (m - 2k)}{2c} + 1, \ldots, \frac{c + i a (m - 2k)}{2c} + 1; -e^{2 c z}\right)\right) +$$

$$2^{-m-u+1} \binom{m}{\frac{m}{2}} (1 - m \bmod 2) n! e^{c z} \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^s \binom{u}{s} \left( (-1)^u e^{(-b (u-2s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c - b (u - 2s))^{-j-1}\right)}{(n-j)!} \right.$$

$${}_{j+2}F_{j+1}\left(\frac{c - b (u - 2s)}{2c}, \ldots, \frac{c - b (u - 2s)}{2c}, 1; \frac{c - b (u - 2s)}{2c} + 1, \ldots, \frac{c - b (u - 2s)}{2c} + 1; -e^{2 c z}\right) +$$

$$e^{(b (u-2s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c + b (u - 2s))^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c + b (u - 2s)}{2c}, \ldots, \frac{c + b (u - 2s)}{2c}, \right.$$

$$\left.\left. 1; \frac{c + b (u - 2s)}{2c} + 1, \ldots, \frac{c + b (u - 2s)}{2c} + 1; -e^{2 c z}\right)\right) + 2^{-m-u+1} n! e^{c z}$$

$$\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^s \binom{u}{s} \left( (-1)^u e^{(i a (m-2k) - b (u-2s)) z - \frac{i m \pi}{2}} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c + a i (m - 2k) - b (u - 2s))^{-j-1}\right)}{(n-j)!} \right.$$

$${}_{j+2}F_{j+1}\left(\frac{c + i a (m - 2k) + b (2s - u)}{2c}, \ldots, \frac{c + i a (m - 2k) + b (2s - u)}{2c}, 1; \right.$$

$$\left. \frac{c + i a (m - 2k) + b (2s - u)}{2c} + 1, \ldots, \frac{c + i a (m - 2k) + b (2s - u)}{2c} + 1; -e^{2 c z}\right) +$$

$$(-1)^u e^{\frac{i \pi m}{2} + (-i a (m-2k) - b (u-2s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c - i a (m - 2k) - b (u - 2s))^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c + 2 i a k - i a m + 2 b s - b u}{2c}, \ldots, \frac{c + 2 i a k - i a m + 2 b s - b u}{2c}, 1; \right.$$

$$\left. \frac{c + 2 i a k - i a m + 2 b s - b u}{2c} + 1, \ldots, \frac{c + 2 i a k - i a m + 2 b s - b u}{2c} + 1; -e^{2 c z}\right) +$$

$$e^{\frac{i\pi m}{2}+(b(u-2s)-i a(m-2k))z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(c-i a(m-2k)+b(u-2s))^{-j-1}\right)}{(n-j)!}$$
$$_{j+2}F_{j+1}\left(\frac{c-i a(m-2k)+b(u-2s)}{2c},\ldots,\frac{c-i a(m-2k)+b(u-2s)}{2c},1;\right.$$
$$\left.\frac{c-i a(m-2k)+b(u-2s)}{2c}+1,\ldots,\frac{c-i a(m-2k)+b(u-2s)}{2c}+1;-e^{2cz}\right)+$$
$$e^{(a i(m-2k)+b(u-2s))z-\frac{i m\pi}{2}}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(c+a i(m-2k)+b(u-2s))^{-j-1}\right)}{(n-j)!}\,_{j+2}F_{j+1}$$
$$\left(\frac{c+i a(m-2k)+b(u-2s)}{2c},\ldots,\frac{c+i a(m-2k)+b(u-2s)}{2c},1;\frac{c+i a(m-2k)+b(u-2s)}{2c}+\right.$$
$$\left.\left.1,\ldots,\frac{c+i a(m-2k)+b(u-2s)}{2c}+1;-e^{2cz}\right)\right)/;n\in\mathbb{N}\land m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

Involving cos, sinh and power

## Involving $z^n\cos(az)\sinh(bz)\operatorname{sech}(cz)$

01.24.21.0269.01

$$\int z^n\cos(az)\sinh(bz)\operatorname{sech}(cz)\,dz=$$
$$\frac{1}{2}n!\,e^{cz}\left(-e^{(-b-i a)z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(-b+c-i a)^{-j-1}\right)}{(n-j)!}\,_{j+2}F_{j+1}\left(\frac{-i a-b+c}{2c},\ldots,\frac{-i a-b+c}{2c},1;\right.\right.$$
$$\left.\frac{-i a-b+c}{2c}+1,\ldots,\frac{-i a-b+c}{2c}+1;-e^{2cz}\right)-e^{(i a-b)z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(-b+c+i a)^{-j-1}\right)}{(n-j)!}$$
$$_{j+2}F_{j+1}\left(\frac{i a-b+c}{2c},\ldots,\frac{i a-b+c}{2c},1;\frac{i a-b+c}{2c}+1,\ldots,\frac{i a-b+c}{2c}+1;-e^{2cz}\right)+$$
$$e^{(b-i a)z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(b-i a+c)^{-j-1}\right)}{(n-j)!}\,_{j+2}F_{j+1}\left(\frac{-i a+b+c}{2c},\ldots,\frac{-i a+b+c}{2c},1;\frac{-i a+b+c}{2c}+1,\right.$$
$$\left.\ldots,\frac{-i a+b+c}{2c}+1;-e^{2cz}\right)+e^{(b+i a)z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(b+c+i a)^{-j-1}\right)}{(n-j)!}$$
$$\left.{}_{j+2}F_{j+1}\left(\frac{i a+b+c}{2c},\ldots,\frac{i a+b+c}{2c},1;\frac{i a+b+c}{2c}+1,\ldots,\frac{i a+b+c}{2c}+1;-e^{2cz}\right)\right)/;n\in\mathbb{N}$$

Involving powers of cos, powers of sinh and power

## Involving $z^n\cos^m(az)\sinh^u(bz)\operatorname{sech}(cz)$

01.24.21.0270.01

$$\int z^n \cos^m(a z) \sinh^u(b z) \operatorname{sech}(c z)\, dz ==$$

$$i^u\, 2^{-m-u+1} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n!\, (1 - m \bmod 2)\, (1 - u \bmod 2)\, e^{c z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} c^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{1}{2}, \ldots, \frac{1}{2}, 1; \frac{3}{2}, \ldots, \frac{3}{2}; -e^{2 c z}\right) -$$

$$i^u\, 2^{-m-u+1} \binom{u}{\frac{u}{2}} (u \bmod 2 - 1)\, n!\, e^{c z} \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \Bigg( e^{(-i a (m-2 s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c - i a (m-2 s))^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c - i a (m-2 s)}{2 c}, \ldots, \frac{c - i a (m-2 s)}{2 c}, 1; \frac{c - i a (m-2 s)}{2 c} + 1, \ldots, \frac{c - i a (m-2 s)}{2 c} + 1; -e^{2 c z}\right) +$$

$$e^{(i a (m-2 s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c + a i (m-2 s))^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c + i a (m-2 s)}{2 c}, \ldots, \frac{c + i a (m-2 s)}{2 c},\right.$$

$$\left.1; \frac{c + i a (m-2 s)}{2 c} + 1, \ldots, \frac{c + i a (m-2 s)}{2 c} + 1; -e^{2 c z}\right)\Bigg) + 2^{-m-u+1} \binom{m}{\frac{m}{2}} (1 - m \bmod 2)\, n!\, e^{c z}$$

$$\sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{u}{k} \Bigg( (-1)^u e^{-b (u-2 k) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c - b (u-2 k))^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c - b (u-2 k)}{2 c}, \ldots, \frac{c - b (u-2 k)}{2 c},\right.$$

$$\left.1; \frac{c - b (u-2 k)}{2 c} + 1, \ldots, \frac{c - b (u-2 k)}{2 c} + 1; -e^{2 c z}\right) + e^{b (u-2 k) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c + b (u-2 k))^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c + b (u-2 k)}{2 c}, \ldots, \frac{c + b (u-2 k)}{2 c}, 1; \frac{c + b (u-2 k)}{2 c} + 1, \ldots, \frac{c + b (u-2 k)}{2 c} + 1; -e^{2 c z}\right)\Bigg) +$$

$$2^{-m-u+1} n!\, e^{c z} \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{s} \binom{u}{k} \Bigg( (-1)^u e^{(-i a (m-2 s) - b (u-2 k)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c - i a (m-2 s) - b (u-2 k))^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c - i a (m-2 s) - b (u-2 k)}{2 c}, \ldots, \frac{c - i a (m-2 s) - b (u-2 k)}{2 c}, 1;\right.$$

$$\left.\frac{c - i a (m-2 s) - b (u-2 k)}{2 c} + 1, \ldots, \frac{c - i a (m-2 s) - b (u-2 k)}{2 c} + 1; -e^{2 c z}\right) +$$

$$(-1)^u e^{(i a (m-2 s) - b (u-2 k)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c + a i (m-2 s) - b (u-2 k))^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c + i a (m-2 s) - b (u-2 k)}{2 c}, \ldots, \frac{c + i a (m-2 s) - b (u-2 k)}{2 c}, 1;\right.$$

$$\left.\frac{c + i a (m-2 s) - b (u-2 k)}{2 c} + 1, \ldots, \frac{c + i a (m-2 s) - b (u-2 k)}{2 c} + 1; -e^{2 c z}\right) +$$

$$e^{(b (u-2 k) - i a (m-2 s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c - i a (m-2 s) + b (u-2 k))^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c - i a (m-2 s) + b (u-2 k)}{2 c}, \ldots, \frac{c - i a (m-2 s) + b (u-2 k)}{2 c}, 1;\right.$$

$$\frac{c - i\,a\,(m-2\,s) + b\,(u-2\,k)}{2\,c} + 1,\,\ldots,\,\frac{c - i\,a\,(m-2\,s) + b\,(u-2\,k)}{2\,c} + 1;\, -e^{2\,c\,z}\Bigg) +$$

$$e^{(a\,i\,(m-2\,s)+b\,(u-2\,k))\,z} \sum_{j=0}^{n} \frac{\left((-1)^j\, z^{n-j}\, (c + a\,i\,(m-2\,s) + b\,(u-2\,k))^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}$$

$$\Bigg(\frac{c + i\,a\,(m-2\,s) + b\,(u-2\,k)}{2\,c},\,\ldots,\,\frac{c + i\,a\,(m-2\,s) + b\,(u-2\,k)}{2\,c},\,1;\,\frac{c + i\,a\,(m-2\,s) + b\,(u-2\,k)}{2\,c} + 1,$$

$$\ldots,\,\frac{c + i\,a\,(m-2\,s) + b\,(u-2\,k)}{2\,c} + 1;\, -e^{2\,c\,z}\Bigg)\Bigg) /;\, n \in \mathbb{N} \bigwedge m \in \mathbb{N}^+ \bigwedge u \in \mathbb{N}^+$$

Involving sin, cosh and power

## Involving $z^n \sin(a\,z) \cosh(b\,z) \operatorname{sech}(c\,z)$

01.24.21.0271.01

$$\int z^n \sin(a\,z) \cosh(b\,z) \operatorname{sech}(c\,z)\, dz =$$

$$\frac{1}{2}\, n!\, e^{c\,z} \Bigg( e^{\frac{i\pi}{2} + (-b - i\,a)\,z} \sum_{j=0}^{n} \frac{\left((-1)^j\, z^{n-j}\, (-b + c - i\,a)^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\Bigg(\frac{-i\,a - b + c}{2\,c},\,\ldots,\,\frac{-i\,a - b + c}{2\,c},\,1;$$

$$\frac{-i\,a - b + c}{2\,c} + 1,\,\ldots,\,\frac{-i\,a - b + c}{2\,c} + 1;\, -e^{2\,c\,z}\Bigg) - e^{\frac{i\pi}{2} + (i\,a - b)\,z} \sum_{j=0}^{n} \frac{\left((-1)^j\, z^{n-j}\, (-b + c + i\,a)^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{i\,a - b + c}{2\,c},\,\ldots,\,\frac{i\,a - b + c}{2\,c},\,1;\,\frac{i\,a - b + c}{2\,c} + 1,\,\ldots,\,\frac{i\,a - b + c}{2\,c} + 1;\, -e^{2\,c\,z}\Bigg) -$$

$$e^{-\frac{1}{2}(i\,\pi) + (b - i\,a)\,z} \sum_{j=0}^{n} \frac{\left((-1)^j\, z^{n-j}\, (b + c - i\,a)^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\Bigg(\frac{-i\,a + b + c}{2\,c},\,\ldots,\,\frac{-i\,a + b + c}{2\,c},\,1;\,\frac{-i\,a + b + c}{2\,c} + 1,$$

$$\ldots,\,\frac{-i\,a + b + c}{2\,c} + 1;\, -e^{2\,c\,z}\Bigg) + e^{-\frac{1}{2}(i\,\pi) + (b + i\,a)\,z} \sum_{j=0}^{n} \frac{\left((-1)^j\, z^{n-j}\, (b + c + i\,a)^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{i\,a + b + c}{2\,c},\,\ldots,\,\frac{i\,a + b + c}{2\,c},\,1;\,\frac{i\,a + b + c}{2\,c} + 1,\,\ldots,\,\frac{i\,a + b + c}{2\,c} + 1;\, -e^{2\,c\,z}\Bigg)\Bigg) /;\, n \in \mathbb{N}$$

Involving powers of sin, powers of cosh and power

## Involving $z^n \sin^m(a\,z) \cosh^u(b\,z) \operatorname{sech}(c\,z)$

01.24.21.0272.01

$$\int z^n \sin^m(a\,z) \cosh^u(b\,z) \operatorname{sech}(c\,z)\, dz =$$

$$2^{-m-u+1}\, e^{c\,z} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}}\, n!\, (1 - m \bmod 2)\, (1 - u \bmod 2) \sum_{j=0}^{n} \frac{\left((-1)^j\, z^{n-j}\, c^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\Bigg(\frac{1}{2},\,\ldots,\,\frac{1}{2},\,1;\,\frac{3}{2},\,\ldots,\,\frac{3}{2};\, -e^{2\,c\,z}\Bigg) +$$

$$2^{-m-u+1} e^{cz} \binom{u}{\frac{u}{2}} n! \, (1 - u \bmod 2) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \Bigg( e^{\frac{i m \pi}{2} - (i a (m-2k)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c - i a (m-2k))^{-j-1}\right)}{(n-j)!}$$

$$\,_{j+2}F_{j+1}\left(\frac{c - i a (m-2k)}{2c}, \ldots, \frac{c - i a (m-2k)}{2c}, 1; \frac{c - i a (m-2k)}{2c} + 1, \ldots, \frac{c - i a (m-2k)}{2c} + 1; -e^{2cz}\right) +$$

$$e^{(i a (m-2k)) z - \frac{i m \pi}{2}} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c + a i (m-2k))^{-j-1}\right)}{(n-j)!} \,_{j+2}F_{j+1}\Bigg(\frac{c + i a (m-2k)}{2c}, \ldots, \frac{c + i a (m-2k)}{2c},$$

$$1; \frac{c + i a (m-2k)}{2c} + 1, \ldots, \frac{c + i a (m-2k)}{2c} + 1; -e^{2cz}\Bigg)\Bigg) - 2^{-m-u+1} \binom{m}{\frac{m}{2}} (m \bmod 2 - 1) \, n! \, e^{cz}$$

$$\sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \Bigg( e^{(-b (u-2s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c - b (u-2s))^{-j-1}\right)}{(n-j)!} \,_{j+2}F_{j+1}\Bigg(\frac{c - b (u-2s)}{2c}, \ldots, \frac{c - b (u-2s)}{2c}, 1;$$

$$\frac{c - b (u-2s)}{2c} + 1, \ldots, \frac{c - b (u-2s)}{2c} + 1; -e^{2cz}\Bigg) + e^{(b (u-2s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c + b (u-2s))^{-j-1}\right)}{(n-j)!}$$

$$\,_{j+2}F_{j+1}\left(\frac{c + b (u-2s)}{2c}, \ldots, \frac{c + b (u-2s)}{2c}, 1; \frac{c + b (u-2s)}{2c} + 1, \ldots, \frac{c + b (u-2s)}{2c} + 1; -e^{2cz}\right)\Bigg) +$$

$$2^{-m-u+1} e^{cz} n! \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \binom{u}{s} \Bigg( e^{(i a (m-2k) - b (u-2s)) z - \frac{i m \pi}{2}} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c + a i (m-2k) - b (u-2s))^{-j-1}\right)}{(n-j)!}$$

$$\,_{j+2}F_{j+1}\Bigg(\frac{c + i a (m-2k) + b (2s-u)}{2c}, \ldots, \frac{c + i a (m-2k) + b (2s-u)}{2c}, 1;$$

$$\frac{c + i a (m-2k) + b (2s-u)}{2c} + 1, \ldots, \frac{c + i a (m-2k) + b (2s-u)}{2c} + 1; -e^{2cz}\Bigg) +$$

$$e^{\frac{i \pi m}{2} + (-i a (m-2k) - b (u-2s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c - i a (m-2k) - b (u-2s))^{-j-1}\right)}{(n-j)!}$$

$$\,_{j+2}F_{j+1}\Bigg(\frac{c + 2 i a k - i a m + 2 b s - b u}{2c}, \ldots, \frac{c + 2 i a k - i a m + 2 b s - b u}{2c}, 1;$$

$$\frac{c + 2 i a k - i a m + 2 b s - b u}{2c} + 1, \ldots, \frac{c + 2 i a k - i a m + 2 b s - b u}{2c} + 1; -e^{2cz}\Bigg) +$$

$$e^{\frac{i \pi m}{2} + (b (u-2s) - i a (m-2k)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c - i a (m-2k) + b (u-2s))^{-j-1}\right)}{(n-j)!}$$

$$\,_{j+2}F_{j+1}\Bigg(\frac{c - i a (m-2k) + b (u-2s)}{2c}, \ldots, \frac{c - i a (m-2k) + b (u-2s)}{2c}, 1;$$

$$\frac{c - i a (m-2k) + b (u-2s)}{2c} + 1, \ldots, \frac{c - i a (m-2k) + b (u-2s)}{2c} + 1; -e^{2cz}\Bigg) +$$

$$e^{(a\,i\,(m-2k)+b\,(u-2s))\,z-\frac{i\,m\,\pi}{2}} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c+a\,i\,(m-2k)+b\,(u-2s))^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c+i\,a\,(m-2k)+b\,(u-2s)}{2c}, \ldots, \frac{c+i\,a\,(m-2k)+b\,(u-2s)}{2c}, 1; \frac{c+i\,a\,(m-2k)+b\,(u-2s)}{2c}+1, \ldots, \frac{c+i\,a\,(m-2k)+b\,(u-2s)}{2c}+1; -e^{2cz}\right)\Bigg) /; n \in \mathbb{N} \bigwedge m \in \mathbb{N}^+ \bigwedge u \in \mathbb{N}^+$$

Involving cos, cosh and power

## Involving $z^n \cos(a\,z) \cosh(b\,z) \operatorname{sech}(c\,z)$

01.24.21.0273.01

$$\int z^n \cos(a\,z) \cosh(b\,z) \operatorname{sech}(c\,z)\, dz = \frac{1}{2} n!\, e^{cz} \Bigg( e^{(-b-i\,a)\,z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (-b+c-i\,a)^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{-i\,a-b+c}{2c}, \ldots, \frac{-i\,a-b+c}{2c}, 1; \frac{-i\,a-b+c}{2c}+1, \ldots, \frac{-i\,a-b+c}{2c}+1; -e^{2cz}\right) + e^{(i\,a-b)\,z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (-b+c+i\,a)^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{i\,a-b+c}{2c}, \ldots, \frac{i\,a-b+c}{2c}, 1; \frac{i\,a-b+c}{2c}+1, \ldots, \frac{i\,a-b+c}{2c}+1; -e^{2cz}\right) + e^{(b-i\,a)\,z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (b+c-i\,a)^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{-i\,a+b+c}{2c}, \ldots, \frac{-i\,a+b+c}{2c}, 1; \frac{-i\,a+b+c}{2c}+1, \ldots, \frac{-i\,a+b+c}{2c}+1; -e^{2cz}\right) + e^{(b+i\,a)\,z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (b+c+i\,a)^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{i\,a+b+c}{2c}, \ldots, \frac{i\,a+b+c}{2c}, 1; \frac{i\,a+b+c}{2c}+1, \ldots, \frac{i\,a+b+c}{2c}+1; -e^{2cz}\right)\Bigg) /; n \in \mathbb{N}$$

Involving powers of cos, powers of cosh and power

## Involving $z^n \cos^m(a\,z) \cosh^u(b\,z) \operatorname{sech}(c\,z)$

01.24.21.0274.01

$$\int z^n \cos^m(a\,z) \cosh^u(b\,z) \operatorname{sech}(c\,z)\, dz = 2^{-m-u+1} e^{cz} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n!\, (1 - m \bmod 2)\, (1 - u \bmod 2) \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} c^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{1}{2}, \ldots, \frac{1}{2}, 1; \frac{3}{2}, \ldots, \frac{3}{2}; -e^{2cz}\right) - 2^{-m-u+1} \binom{u}{\frac{u}{2}} (u \bmod 2 - 1)\, n!\, e^{cz} \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \Bigg( e^{-i\,a\,(m-2s)\,z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c-i\,a\,(m-2s))^{-j-1}\right)}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\left(\frac{c-i\,a\,(m-2\,s)}{2\,c},\,\ldots,\,\frac{c-i\,a\,(m-2\,s)}{2\,c},\,1;\,\frac{c-i\,a\,(m-2\,s)}{2\,c}+1,\,\ldots,\,\frac{c-i\,a\,(m-2\,s)}{2\,c}+1;\,-e^{2\,c\,z}\right)+ $$

$$ e^{i\,a\,(m-2\,s)\,z}\sum_{j=0}^{n}\frac{\left((-1)^{j}\,z^{n-j}\,(c+a\,i\,(m-2\,s))^{-j-1}\right)}{(n-j)!}\;{}_{j+2}F_{j+1}\left(\frac{c+i\,a\,(m-2\,s)}{2\,c},\,\ldots,\,\frac{c+i\,a\,(m-2\,s)}{2\,c},\,1;\right. $$

$$ \left.\left.\frac{c+i\,a\,(m-2\,s)}{2\,c}+1,\,\ldots,\,\frac{c+i\,a\,(m-2\,s)}{2\,c}+1;\,-e^{2\,c\,z}\right)\right)+2^{-m-u+1}\,e^{c\,z}\binom{m}{\frac{m}{2}}n!\,(1-m\bmod 2) $$

$$ \sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(e^{-b\,(u-2\,s)\,z}\sum_{j=0}^{n}\frac{\left((-1)^{j}\,z^{n-j}\,(c-b\,(u-2\,s))^{-j-1}\right)}{(n-j)!}\;{}_{j+2}F_{j+1}\left(\frac{c-b\,(u-2\,s)}{2\,c},\,\ldots,\,\frac{c-b\,(u-2\,s)}{2\,c},\,1;\right.\right. $$

$$ \left.\frac{c-b\,(u-2\,s)}{2\,c}+1,\,\ldots,\,\frac{c-b\,(u-2\,s)}{2\,c}+1;\,-e^{2\,c\,z}\right)+e^{b\,(u-2\,s)\,z}\sum_{j=0}^{n}\frac{\left((-1)^{j}\,z^{n-j}\,(c+b\,(u-2\,s))^{-j-1}\right)}{(n-j)!} $$

$$ \left.{}_{j+2}F_{j+1}\left(\frac{c+b\,(u-2\,s)}{2\,c},\,\ldots,\,\frac{c+b\,(u-2\,s)}{2\,c},\,1;\,\frac{c+b\,(u-2\,s)}{2\,c}+1,\,\ldots,\,\frac{c+b\,(u-2\,s)}{2\,c}+1;\,-e^{2\,c\,z}\right)\right)+ $$

$$ 2^{-m-u+1}\,e^{c\,z}\,n!\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\binom{u}{s}\left(e^{(-i\,a\,(m-2\,k)-b\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^{j}\,z^{n-j}\,(c-i\,a\,(m-2\,k)-b\,(u-2\,s))^{-j-1}\right)}{(n-j)!}\right. $$

$$ {}_{j+2}F_{j+1}\left(\frac{c-i\,a\,(m-2\,k)-b\,(u-2\,s)}{2\,c},\,\ldots,\,\frac{c-i\,a\,(m-2\,k)-b\,(u-2\,s)}{2\,c},\,1;\right. $$

$$ \left.\frac{c-i\,a\,(m-2\,k)-b\,(u-2\,s)}{2\,c}+1,\,\ldots,\,\frac{c-i\,a\,(m-2\,k)-b\,(u-2\,s)}{2\,c}+1;\,-e^{2\,c\,z}\right)+ $$

$$ e^{(i\,a\,(m-2\,k)-b\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^{j}\,z^{n-j}\,(c+a\,i\,(m-2\,k)-b\,(u-2\,s))^{-j-1}\right)}{(n-j)!} $$

$$ {}_{j+2}F_{j+1}\left(\frac{c+i\,a\,(m-2\,k)-b\,(u-2\,s)}{2\,c},\,\ldots,\,\frac{c+i\,a\,(m-2\,k)-b\,(u-2\,s)}{2\,c},\,1;\right. $$

$$ \left.\frac{c+i\,a\,(m-2\,k)-b\,(u-2\,s)}{2\,c}+1,\,\ldots,\,\frac{c+i\,a\,(m-2\,k)-b\,(u-2\,s)}{2\,c}+1;\,-e^{2\,c\,z}\right)+ $$

$$ e^{(b\,(u-2\,s)-i\,a\,(m-2\,k))\,z}\sum_{j=0}^{n}\frac{\left((-1)^{j}\,z^{n-j}\,(c-i\,a\,(m-2\,k)+b\,(u-2\,s))^{-j-1}\right)}{(n-j)!} $$

$$ {}_{j+2}F_{j+1}\left(\frac{c-i\,a\,(m-2\,k)+b\,(u-2\,s)}{2\,c},\,\ldots,\,\frac{c-i\,a\,(m-2\,k)+b\,(u-2\,s)}{2\,c},\,1;\right. $$

$$ \left.\frac{c-i\,a\,(m-2\,k)+b\,(u-2\,s)}{2\,c}+1,\,\ldots,\,\frac{c-i\,a\,(m-2\,k)+b\,(u-2\,s)}{2\,c}+1;\,-e^{2\,c\,z}\right)+ $$

$$ e^{(a\,i\,(m-2\,k)+b\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^{j}\,z^{n-j}\,(c+a\,i\,(m-2\,k)+b\,(u-2\,s))^{-j-1}\right)}{(n-j)!}\;{}_{j+2}F_{j+1} $$

$$ \left(\frac{c+i\,a\,(m-2\,k)+b\,(u-2\,s)}{2\,c},\,\ldots,\,\frac{c+i\,a\,(m-2\,k)+b\,(u-2\,s)}{2\,c},\,1;\,\frac{c+i\,a\,(m-2\,k)+b\,(u-2\,s)}{2\,c}+1,\right. $$

$$ \left.\left.\ldots,\,\frac{c+i\,a\,(m-2\,k)+b\,(u-2\,s)}{2\,c}+1;\,-e^{2\,c\,z}\right)\right)\;/;\;n\in\mathbb{N}\land m\in\mathbb{N}^{+}\land u\in\mathbb{N}^{+} $$

Involving sin, tanh and power

## Involving $z^n \sin(a z) \tanh(c z) \operatorname{sech}(c z)$

01.24.21.0275.01

$$\int z^n \sin(a z) \tanh(c z) \operatorname{sech}(c z)\, dz = e^{2 c z} n! \left( -e^{\frac{i \pi}{2} + (-c - i a) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c - i a)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{c - i a}{2 c}, \ldots, \frac{c - i a}{2 c}, 2; \frac{c - i a}{2 c} + 1, \ldots, \frac{c - i a}{2 c} + 1; -e^{2 c z} \right) + e^{\frac{i \pi}{2} + (i a - c) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c + i a)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{i a + c}{2 c}, \ldots, \frac{i a + c}{2 c}, 2; \frac{i a + c}{2 c} + 1, \ldots, \frac{i a + c}{2 c} + 1; -e^{2 c z} \right) - e^{-\frac{1}{2} (i \pi) + (c - i a) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (3 c - i a)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{3 c - i a}{2 c}, \ldots, \frac{3 c - i a}{2 c}, 2; \frac{3 c - i a}{2 c} + 1, \ldots, \frac{3 c - i a}{2 c} + 1; -e^{2 c z} \right) + e^{-\frac{1}{2} (i \pi) + (c + i a) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (3 c + i a)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{i a + 3 c}{2 c}, \ldots, \frac{i a + 3 c}{2 c}, 2; \frac{i a + 3 c}{2 c} + 1, \ldots, \frac{i a + 3 c}{2 c} + 1; -e^{2 c z} \right) \right) /; n \in \mathbb{N}$$

Involving powers of sin, powers of tanh and power

## Involving $z^n \sin^m(a z) \tanh^u(c z) \operatorname{sech}(c z)$

01.24.21.0276.01

$$\int z^n \sin^m(a z) \tanh^u(c z) \operatorname{sech}(c z)\, dz = i^u 2^{1-m} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! (1 - m \bmod 2)(1 - u \bmod 2) e^{c (u+1) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c (u+1))^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{u+1}{2}, \ldots, \frac{u+1}{2}, u+1; \frac{u+1}{2} + 1, \ldots, \frac{u+1}{2} + 1; -e^{2 c z} \right) + i^{m+u} 2^{1-m} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) n! e^{c (u+1) z} \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left( e^{-i a (m - 2 k) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} ((u+1) c + a i (2 k - m))^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{i a (2 k - m) + c (u+1)}{2 c}, \ldots, \frac{i a (2 k - m) + c (u+1)}{2 c}, u+1; \frac{i a (2 k - m) + c (u+1)}{2 c} + 1, \ldots, \frac{i a (2 k - m) + c (u+1)}{2 c} + 1; -e^{2 c z} \right) + (-1)^m e^{i a (m - 2 k) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} ((u+1) c + a i (m - 2 k))^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{i a (m - 2 k) + c (u+1)}{2 c}, \ldots, \frac{i a (m - 2 k) + c (u+1)}{2 c}, u+1; \frac{i a (m - 2 k) + c (u+1)}{2 c} + 1, \ldots, \frac{i a (m - 2 k) + c (u+1)}{2 c} + 1; -e^{2 c z} \right) \right) +$$

$$2^{1-m}\binom{m}{\frac{m}{2}}(1-m \bmod 2)\, n!\, e^{c(u+1)z} \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^s \binom{u}{s} \Bigg( (-1)^u e^{-c(u-2s)z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c(2s+1))^{-j-1}\right)}{(n-j)!}$$

$$_{j+2}F_{j+1}\left(\frac{1}{2}(2s+1), \ldots, \frac{1}{2}(2s+1), u+1; \frac{1}{2}(2s+1)+1, \ldots, \frac{1}{2}(2s+1)+1; -e^{2cz}\right) +$$

$$e^{c(u-2s)z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c(-2s+2u+1))^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\Bigg(\frac{1}{2}(-2s+2u+1), \ldots, \frac{1}{2}(-2s+2u+1),$$

$$u+1; \frac{1}{2}(-2s+2u+1)+1, \ldots, \frac{1}{2}(-2s+2u+1)+1; -e^{2cz}\Bigg)\Bigg) + 2^{1-m}\, n!\, e^{c(u+1)z}$$

$$\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^s \binom{u}{s} \Bigg( (-1)^u e^{\frac{i\pi m}{2}+(-i a(m-2k)-c(u-2s))z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (2sc+c+2iak-iam)^{-j-1}\right)}{(n-j)!}$$

$$_{j+2}F_{j+1}\Bigg(\frac{2sc+c+2iak-iam}{2c}, \ldots, \frac{2sc+c+2iak-iam}{2c}, u+$$

$$1; \frac{2sc+c+2iak-iam}{2c}+1, \ldots, \frac{2sc+c+2iak-iam}{2c}+1; -e^{2cz}\Bigg) +$$

$$(-1)^u e^{(ia(m-2k)-c(u-2s))z-\frac{im\pi}{2}} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (2sc+c-2iak+iam)^{-j-1}\right)}{(n-j)!}$$

$$_{j+2}F_{j+1}\Bigg(\frac{2sc+c-2iak+iam}{2c}, \ldots, \frac{2sc+c-2iak+iam}{2c}, u+1; \frac{2sc+c-2iak+iam}{2c}+$$

$$1, \ldots, \frac{2sc+c-2iak+iam}{2c}+1; -e^{2cz}\Bigg) + e^{\frac{i\pi m}{2}+(c(u-2s)-ia(m-2k))z}$$

$$\sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} ((-2s+2u+1)c+ai(2k-m))^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\Bigg(\frac{ia(2k-m)+c(-2s+2u+1)}{2c},$$

$$\ldots, \frac{ia(2k-m)+c(-2s+2u+1)}{2c}, u+1; \frac{ia(2k-m)+c(-2s+2u+1)}{2c}+$$

$$1, \ldots, \frac{ia(2k-m)+c(-2s+2u+1)}{2c}+1; -e^{2cz}\Bigg) + e^{(ai(m-2k)+c(u-2s))z-\frac{im\pi}{2}}$$

$$\sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} ((-2s+2u+1)c+ai(m-2k))^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\Bigg(\frac{ia(m-2k)+c(-2s+2u+1)}{2c},$$

$$\ldots, \frac{ia(m-2k)+c(-2s+2u+1)}{2c}, u+1; \frac{ia(m-2k)+c(-2s+2u+1)}{2c}+$$

$$1, \ldots, \frac{ia(m-2k)+c(-2s+2u+1)}{2c}+1; -e^{2cz}\Bigg)\Bigg) /; n \in \mathbb{N} \land m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

## Involving cos, tanh and power

## Involving $z^n \cos(a z) \tanh(c z) \operatorname{sech}(c z)$

01.24.21.0277.01

$$\int z^n \cos(a z) \tanh(c z) \operatorname{sech}(c z)\, dz = e^{2cz} n! \left(-e^{(-c-i a) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c-i a)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c-i a}{2c}, \ldots, \frac{c-i a}{2c}, 2; \frac{c-i a}{2c}+1, \ldots, \frac{c-i a}{2c}+1; -e^{2cz}\right) - e^{(i a-c) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c+i a)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a+c}{2c}, \ldots, \frac{i a+c}{2c}, 2; \frac{i a+c}{2c}+1, \ldots, \frac{i a+c}{2c}+1; -e^{2cz}\right) + e^{(c-i a) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (3c-i a)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{3c-i a}{2c}, \ldots, \frac{3c-i a}{2c}, 2; \frac{3c-i a}{2c}+1, \ldots, \frac{3c-i a}{2c}+1; -e^{2cz}\right) + e^{(c+i a) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (3c+i a)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a+3c}{2c}, \ldots, \frac{i a+3c}{2c}, 2; \frac{i a+3c}{2c}+1, \ldots, \frac{i a+3c}{2c}+1; -e^{2cz}\right)\right) /; n \in \mathbb{N}$$

Involving powers of cos, powers of tanh and power

## Involving $z^n \cos^m(a z) \tanh^u(c z) \operatorname{sech}(c z)$

01.24.21.0278.01

$$\int z^n \cos^m(a z) \tanh^u(c z) \operatorname{sech}(c z)\, dz = i^u 2^{1-m} e^{c(u+1) z} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! (1 - m \bmod 2)(1 - u \bmod 2) \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c(u+1))^{-j-1}\right)}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{u+1}{2}, \ldots, \frac{u+1}{2}, u+1; \frac{u+1}{2}+1, \ldots, \frac{u+1}{2}+1; -e^{2cz}\right) - i^u 2^{1-m} \binom{u}{\frac{u}{2}} (u \bmod 2 - 1) n! e^{c(u+1) z} \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \left(e^{-i a (m-2s) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c(u+1) - i a (m-2s))^{-j-1}\right)}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{-i a (m-2s) + c(u+1)}{2c}, \ldots, \frac{-i a (m-2s) + c(u+1)}{2c}, u+1; \frac{-i a (m-2s) + c(u+1)}{2c}+1, \ldots, \frac{-i a (m-2s) + c(u+1)}{2c}+1; -e^{2cz}\right) + e^{i a (m-2s) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (a i (m-2s) + c(u+1))^{-j-1}\right)}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a (m-2s) + c(u+1)}{2c}, \ldots, \frac{i a (m-2s) + c(u+1)}{2c}, u+1; \frac{i a (m-2s) + c(u+1)}{2c}+1, \ldots, \frac{i a (m-2s) + c(u+1)}{2c}+1; -e^{2cz}\right)\right) + 2^{1-m} \binom{m}{\frac{m}{2}} (1 - m \bmod 2) n! e^{c(u+1) z} \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{u}{k} \left((-1)^u e^{-c(u-2k) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c(2k+1))^{-j-1}\right)}{(n-j)!}\right.$$

$$_{j+2}F_{j+1}\left(\frac{1}{2}(2k+1),\, \ldots,\, \frac{1}{2}(2k+1),\, u+1;\, \frac{1}{2}(2k+1)+1,\, \ldots,\, \frac{1}{2}(2k+1)+1;\, -e^{2cz}\right)+$$

$$e^{c(u-2k)z}\sum_{j=0}^{n}\frac{\left((-1)^{j} z^{n-j}\,(c(-2k+2u+1))^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{1}{2}(-2k+2u+1),\, \ldots,\, \frac{1}{2}(-2k+2u+1),\right.$$

$$\left.\left. u+1;\, \frac{1}{2}(-2k+2u+1)+1,\, \ldots,\, \frac{1}{2}(-2k+2u+1)+1;\, -e^{2cz}\right)\right)+$$

$$2^{1-m}\,n!\,e^{c(u+1)z}\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^{k}\binom{m}{s}\binom{u}{k}\left((-1)^{u}\,e^{(-i a(m-2s)-c(u-2k))z}\sum_{j=0}^{n}\frac{\left((-1)^{j} z^{n-j}\,(c(2k+1)-i a(m-2s))^{-j-1}\right)}{(n-j)!}\right.$$

$$_{j+2}F_{j+1}\left(\frac{c(2k+1)-i a(m-2s)}{2c},\, \ldots,\, \frac{c(2k+1)-i a(m-2s)}{2c},\, u+1;\right.$$

$$\left.\frac{c(2k+1)-i a(m-2s)}{2c}+1,\, \ldots,\, \frac{c(2k+1)-i a(m-2s)}{2c}+1;\, -e^{2cz}\right)+$$

$$(-1)^{u}\,e^{(i a(m-2s)-c(u-2k))z}\sum_{j=0}^{n}\frac{\left((-1)^{j} z^{n-j}\,(c(2k+1)+a i(m-2s))^{-j-1}\right)}{(n-j)!}$$

$$_{j+2}F_{j+1}\left(\frac{c(2k+1)+i a(m-2s)}{2c},\, \ldots,\, \frac{c(2k+1)+i a(m-2s)}{2c},\, u+1;\right.$$

$$\left.\frac{c(2k+1)+i a(m-2s)}{2c}+1,\, \ldots,\, \frac{c(2k+1)+i a(m-2s)}{2c}+1;\, -e^{2cz}\right)+e^{(c(u-2k)-i a(m-2s))z}$$

$$\sum_{j=0}^{n}\frac{\left((-1)^{j} z^{n-j}\,(c(-2k+2u+1)-i a(m-2s))^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{c(-2k+2u+1)-i a(m-2s)}{2c},\right.$$

$$\ldots,\, \frac{c(-2k+2u+1)-i a(m-2s)}{2c},\, u+1;\, \frac{c(-2k+2u+1)-i a(m-2s)}{2c}+1,$$

$$\left.\ldots,\, \frac{c(-2k+2u+1)-i a(m-2s)}{2c}+1;\, -e^{2cz}\right)+e^{(a i(m-2s)+c(u-2k))z}$$

$$\sum_{j=0}^{n}\frac{\left((-1)^{j} z^{n-j}\,(c(-2k+2u+1)+a i(m-2s))^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{i a(m-2s)+c(-2k+2u+1)}{2c},\right.$$

$$\ldots,\, \frac{i a(m-2s)+c(-2k+2u+1)}{2c},\, u+1;\, \frac{i a(m-2s)+c(-2k+2u+1)}{2c}+1,$$

$$\left.\left.\ldots,\, \frac{i a(m-2s)+c(-2k+2u+1)}{2c}+1;\, -e^{2cz}\right)\right)\, /;\, n\in\mathbb{N}\wedge m\in\mathbb{N}^{+}\wedge u\in\mathbb{N}^{+}$$

## Involving powers of sin, powers of coth and power

### Involving $z^n \sin^m(a z) \coth^u(c z) \operatorname{sech}(c z)$

01.24.21.0279.01

$$\int z^n \sin^m(a z) \coth^u(c z) \operatorname{sech}(c z) \, dz = (-1)^u 2^{1-m} e^{c u z} \binom{m}{\frac{m}{2}} n! \, (1 - m \bmod 2)$$

$$\Bigg(\binom{u-1}{\frac{u-1}{2}} (1 - (u-1) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (c u)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{u}{2}, \ldots, \frac{u}{2}, u; \frac{u}{2}+1, \ldots, \frac{u}{2}+1; e^{2 c z}\right) +$$

$$\sum_{k=0}^{\left\lfloor \frac{u-2}{2} \right\rfloor} \binom{u-1}{k} \Bigg(e^{-c(-2k+u-1) z} \sum_{j=0}^{n} \frac{(-1)^j (c(2k+1))^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{1}{2}(2k+1), \ldots, \frac{1}{2}(2k+1), u; \frac{1}{2}(2k+1)+1, \ldots, \frac{1}{2}(2k+1)+1; e^{2 c z}\right) +$$

$$e^{c(-2k+u-1) z} \sum_{j=0}^{n} \frac{(-1)^j (c(-2k+2u-1))^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\Bigg(\frac{1}{2}(-2k+2u-1), \ldots, \frac{1}{2}(-2k+2u-1),$$

$$u; \frac{1}{2}(-2k+2u-1)+1, \ldots, \frac{1}{2}(-2k+2u-1)+1; e^{2 c z}\Bigg)\Bigg)\Bigg) + (-1)^u 2^{1-m} n! \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^s \binom{m}{s}$$

$$\Bigg(e^{\frac{i m \pi}{2}} \Bigg(e^{(c u - i a (m-2s)) z} \binom{u-1}{\frac{u-1}{2}} (1 - (u-1) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (c u - i a (m-2s))^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\Bigg(\frac{c u - i a (m-2s)}{2c},$$

$$\ldots, \frac{c u - i a (m-2s)}{2c}, u; \frac{c u - i a (m-2s)}{2c} + 1, \ldots, \frac{c u - i a (m-2s)}{2c} + 1; e^{2 c z}\Bigg) +$$

$$e^{c u z} \sum_{k=0}^{\left\lfloor \frac{u-2}{2} \right\rfloor} \binom{u-1}{k} \Bigg(e^{(-i a (m-2s) - c(-2k+u-1)) z} \sum_{j=0}^{n} \frac{(-1)^j (c(2k+1) - i a (m-2s))^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{c(2k+1) - i a (m-2s)}{2c}, \ldots, \frac{c(2k+1) - i a (m-2s)}{2c}, u;$$

$$\frac{c(2k+1) - i a (m-2s)}{2c} + 1, \ldots, \frac{c(2k+1) - i a (m-2s)}{2c} + 1; e^{2 c z}\Bigg) +$$

$$e^{(c(-2k+u-1) - i a (m-2s)) z} \sum_{j=0}^{n} \frac{(-1)^j (c(-2k+2u-1) - i a (m-2s))^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{c(-2k+2u-1) - i a (m-2s)}{2c}, \ldots, \frac{c(-2k+2u-1) - i a (m-2s)}{2c}, u;$$

$$\frac{c(-2k+2u-1) - i a (m-2s)}{2c} + 1, \ldots, \frac{c(-2k+2u-1) - i a (m-2s)}{2c} + 1; e^{2 c z}\Bigg)\Bigg)\Bigg) +$$

$$e^{-\frac{1}{2} i m \pi} \Bigg(e^{(a i (m-2s) + c u) z} \binom{u-1}{\frac{u-1}{2}} (1 - (u-1) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (a i (m-2s) + c u)^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{i a (m-2s) + c u}{2c}, \ldots, \frac{i a (m-2s) + c u}{2c}, u;$$

$$\frac{i\,a\,(m-2\,s)+c\,u}{2\,c}+1,\,\ldots,\,\frac{i\,a\,(m-2\,s)+c\,u}{2\,c}+1;\,e^{2\,c\,z}\Bigg)+$$

$$e^{c\,u\,z}\sum_{k=0}^{\left\lfloor\frac{u-2}{2}\right\rfloor}\binom{u-1}{k}\Bigg(e^{(i\,a\,(m-2\,s)-c\,(-2\,k+u-1))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(c\,(2\,k+1)+a\,i\,(m-2\,s))^{-j-1}\,z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}$$

$$\Bigg(\frac{c\,(2\,k+1)+i\,a\,(m-2\,s)}{2\,c},\,\ldots,\,\frac{c\,(2\,k+1)+i\,a\,(m-2\,s)}{2\,c},\,u;\,\frac{c\,(2\,k+1)+i\,a\,(m-2\,s)}{2\,c}+1,$$

$$\ldots,\,\frac{c\,(2\,k+1)+i\,a\,(m-2\,s)}{2\,c}+1;\,e^{2\,c\,z}\Bigg)+e^{(a\,i\,(m-2\,s)+c\,(-2\,k+u-1))\,z}$$

$$\sum_{j=0}^{n}\frac{(-1)^j\,(a\,i\,(m-2\,s)+c\,(-2\,k+2\,u-1))^{-j-1}\,z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}\Bigg(\frac{i\,a\,(m-2\,s)+c\,(-2\,k+2\,u-1)}{2\,c},$$

$$\ldots,\,\frac{i\,a\,(m-2\,s)+c\,(-2\,k+2\,u-1)}{2\,c},\,u;\,\frac{i\,a\,(m-2\,s)+c\,(-2\,k+2\,u-1)}{2\,c}+1,$$

$$\ldots,\,\frac{i\,a\,(m-2\,s)+c\,(-2\,k+2\,u-1)}{2\,c}+1;\,e^{2\,c\,z}\Bigg)\Bigg)\Bigg)\Bigg)\;/;\;n\in\mathbb{N}\land m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

Involving powers of cos, powers of coth and power

## Involving $z^n\cos^m(a\,z)\coth^u(c\,z)\,\mathrm{sech}(c\,z)$

01.24.21.0280.01

$$\int z^n\cos^m(a\,z)\coth^u(c\,z)\,\mathrm{sech}(c\,z)\,dz = (-1)^u\,2^{1-m}\,e^{c\,u\,z}\binom{m}{\frac{m}{2}}n!\,(1-m\bmod 2)$$

$$\Bigg(\binom{u-1}{\frac{u-1}{2}}(1-(u-1)\bmod 2)\sum_{j=0}^{n}\frac{(-1)^j\,(c\,u)^{-j-1}\,z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}\Bigg(\frac{u}{2},\,\ldots,\,\frac{u}{2},\,u;\,\frac{u}{2}+1,\,\ldots,\,\frac{u}{2}+1;\,e^{2\,c\,z}\Bigg)+$$

$$\sum_{k=0}^{\left\lfloor\frac{u-2}{2}\right\rfloor}\binom{u-1}{k}\Bigg(e^{-c\,(-2\,k+u-1)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(c\,(2\,k+1))^{-j-1}\,z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{1}{2}\,(2\,k+1),\,\ldots,\,\frac{1}{2}\,(2\,k+1),\,u;\,\frac{1}{2}\,(2\,k+1)+1,\,\ldots,\,\frac{1}{2}\,(2\,k+1)+1;\,e^{2\,c\,z}\Bigg)+$$

$$e^{c\,(-2\,k+u-1)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(c\,(-2\,k+2\,u-1))^{-j-1}\,z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}\Bigg(\frac{1}{2}\,(-2\,k+2\,u-1),\,\ldots,\,\frac{1}{2}$$

$$(-2\,k+2\,u-1),\,u;\,\frac{1}{2}\,(-2\,k+2\,u-1)+1,\,\ldots,\,\frac{1}{2}\,(-2\,k+2\,u-1)+1;\,e^{2\,c\,z}\Bigg)\Bigg)\Bigg)+$$

$$(-1)^u\,2^{1-m}\,n!\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\Bigg(e^{(c\,u-i\,a\,(m-2\,s))\,z}\binom{u-1}{\frac{u-1}{2}}(1-(u-1)\bmod 2)\sum_{j=0}^{n}\frac{(-1)^j\,(c\,u-i\,a\,(m-2\,s))^{-j-1}\,z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}$$

$$\left(\frac{c\,u - i\,a\,(m-2\,s)}{2\,c}, \ldots, \frac{c\,u - i\,a\,(m-2\,s)}{2\,c}, u; \frac{c\,u - i\,a\,(m-2\,s)}{2\,c} + 1, \ldots, \frac{c\,u - i\,a\,(m-2\,s)}{2\,c} + 1; e^{2\,c\,z}\right) +$$

$$e^{(a\,i\,(m-2\,s)+c\,u)\,z} \binom{u-1}{\frac{u-1}{2}} (1 - (u-1) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j\,(a\,i\,(m-2\,s) + c\,u)^{-j-1}\,z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}$$

$$\left(\frac{i\,a\,(m-2\,s) + c\,u}{2\,c}, \ldots, \frac{i\,a\,(m-2\,s) + c\,u}{2\,c}, u; \frac{i\,a\,(m-2\,s) + c\,u}{2\,c} + 1, \ldots, \frac{i\,a\,(m-2\,s) + c\,u}{2\,c} + 1; e^{2\,c\,z}\right) +$$

$$e^{c\,u\,z} \sum_{k=0}^{\left\lfloor \frac{u-2}{2} \right\rfloor} \binom{u-1}{k} \left( e^{(-i\,a\,(m-2\,s) - c\,(-2\,k+u-1))\,z} \sum_{j=0}^{n} \frac{(-1)^j\,(c\,(2\,k+1) - i\,a\,(m-2\,s))^{-j-1}\,z^{n-j}}{(n-j)!} \right.$$

$${}_{j+2}F_{j+1}\left(\frac{c\,(2\,k+1) - i\,a\,(m-2\,s)}{2\,c}, \ldots, \frac{c\,(2\,k+1) - i\,a\,(m-2\,s)}{2\,c}, u;\right.$$

$$\left.\frac{c\,(2\,k+1) - i\,a\,(m-2\,s)}{2\,c} + 1, \ldots, \frac{c\,(2\,k+1) - i\,a\,(m-2\,s)}{2\,c} + 1; e^{2\,c\,z}\right) +$$

$$e^{(c\,(-2\,k+u-1) - i\,a\,(m-2\,s))\,z} \sum_{j=0}^{n} \frac{(-1)^j\,(c\,(-2\,k+2\,u-1) - i\,a\,(m-2\,s))^{-j-1}\,z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c\,(-2\,k+2\,u-1) - i\,a\,(m-2\,s)}{2\,c}, \ldots, \frac{c\,(-2\,k+2\,u-1) - i\,a\,(m-2\,s)}{2\,c}, u;\right.$$

$$\left.\left.\frac{c\,(-2\,k+2\,u-1) - i\,a\,(m-2\,s)}{2\,c} + 1, \ldots, \frac{c\,(-2\,k+2\,u-1) - i\,a\,(m-2\,s)}{2\,c} + 1; e^{2\,c\,z}\right)\right) +$$

$$e^{c\,u\,z} \sum_{k=0}^{\left\lfloor \frac{u-2}{2} \right\rfloor} \binom{u-1}{k} \left( e^{(i\,a\,(m-2\,s) - c\,(-2\,k+u-1))\,z} \sum_{j=0}^{n} \frac{(-1)^j\,(c\,(2\,k+1) + a\,i\,(m-2\,s))^{-j-1}\,z^{n-j}}{(n-j)!} \right.$$

$${}_{j+2}F_{j+1}\left(\frac{c\,(2\,k+1) + i\,a\,(m-2\,s)}{2\,c}, \ldots, \frac{c\,(2\,k+1) + i\,a\,(m-2\,s)}{2\,c}, u; \frac{c\,(2\,k+1) + i\,a\,(m-2\,s)}{2\,c} + 1,\right.$$

$$\left.\ldots, \frac{c\,(2\,k+1) + i\,a\,(m-2\,s)}{2\,c} + 1; e^{2\,c\,z}\right) + e^{(a\,i\,(m-2\,s) + c\,(-2\,k+u-1))\,z}$$

$$\sum_{j=0}^{n} \frac{(-1)^j\,(a\,i\,(m-2\,s) + c\,(-2\,k+2\,u-1))^{-j-1}\,z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{i\,a\,(m-2\,s) + c\,(-2\,k+2\,u-1)}{2\,c},\right.$$

$$\ldots, \frac{i\,a\,(m-2\,s) + c\,(-2\,k+2\,u-1)}{2\,c}, u; \frac{i\,a\,(m-2\,s) + c\,(-2\,k+2\,u-1)}{2\,c} + 1,$$

$$\left.\left.\left.\ldots, \frac{i\,a\,(m-2\,s) + c\,(-2\,k+2\,u-1)}{2\,c} + 1; e^{2\,c\,z}\right)\right)\right) /; n \in \mathbb{N} \land m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

## Involving hyperbolic, exponential, trigonometric and a power functions

### Involving sin, sinh, exp and power

## Involving $z^n e^{pz} \sin(az) \sinh(bz) \operatorname{sech}(cz)$

01.24.21.0281.01

$$\int z^n e^{pz} \sin(az)\sinh(bz)\operatorname{sech}(cz)\,dz = \frac{1}{2} e^{cz} n! \Bigg(-e^{\frac{i\pi}{2}+(-b-ia+p)z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-b-ia+p+c)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c+p-ia-b}{2c}, \ldots, \frac{c+p-ia-b}{2c}, 1; \frac{c+p-ia-b}{2c}+1, \ldots, \frac{c+p-ia-b}{2c}+1; -e^{2cz}\right) + e^{-\frac{1}{2}(i\pi)+(b+ia+p)z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b+ia+p+c)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c+p+ia+b}{2c}, \ldots, \frac{c+p+ia+b}{2c}, 1; \frac{c+p+ia+b}{2c}+1, \ldots, \frac{c+p+ia+b}{2c}+1; -e^{2cz}\right) - e^{-\frac{1}{2}(i\pi)+(b-ia+p)z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b-ia+p+c)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c+p-ia+b}{2c}, \ldots, \frac{c+p-ia+b}{2c}, 1; \frac{c+p-ia+b}{2c}+1, \ldots, \frac{c+p-ia+b}{2c}+1; -e^{2cz}\right) + e^{\frac{i\pi}{2}+(-b+ia+p)z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-b+ia+p+c)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c+p+ia-b}{2c}, \ldots, \frac{c+p+ia-b}{2c}, 1; \frac{c+p+ia-b}{2c}+1, \ldots, \frac{c+p+ia-b}{2c}+1; -e^{2cz}\right)\Bigg) /; n \in \mathbb{N}$$

Involving powers of sin, powers of sinh, exp and power

## Involving $z^n e^{pz} \sin^m(az) \sinh^u(bz) \operatorname{sech}(cz)$

01.24.21.0282.01

$$\int z^n e^{pz} \sin^m(az)\sinh^u(bz)\operatorname{sech}(cz)\,dz = i^u 2^{-m-u+1} e^{(c+p)z} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! (m \bmod 2 - 1)(u \bmod 2 - 1) \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c+p)^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c+p}{2c}, \ldots, \frac{c+p}{2c}, 1; \frac{c+p}{2c}+1, \ldots, \frac{c+p}{2c}+1; -e^{2cz}\right) + 2^{-m-u+1} i^{m+u} \binom{u}{\frac{u}{2}} n! (1 - u \bmod 2) e^{cz} \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \Bigg(e^{(p-ia(m-2k))z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c+ai(2k-m)+p)^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c+ia(2k-m)+p}{2c}, \ldots, \frac{c+ia(2k-m)+p}{2c}, 1; \frac{c+ia(2k-m)+p}{2c}+1, \ldots, \frac{c+ia(2k-m)+p}{2c}+1; -e^{2cz}\right) + (-1)^m e^{(ai(m-2k)+p)z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c+ai(m-2k)+p)^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c+ia(m-2k)+p}{2c}, \ldots, \frac{c+ia(m-2k)+p}{2c}, 1; \frac{c+ia(m-2k)+p}{2c}+1, \ldots, \frac{c+ia(m-2k)+p}{2c}+1; -e^{2cz}\right)\Bigg) + 2^{-m-u+1} e^{cz} \binom{m}{\frac{m}{2}} n! (1 - m \bmod 2)$$

$$\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}\Bigg((-1)^u e^{(p-b(u-2s))z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(c+p-b(u-2s))^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\Bigg(\frac{c+p-b(u-2s)}{2c},$$

$$\ldots,\frac{c+p-b(u-2s)}{2c},1;\frac{c+p-b(u-2s)}{2c}+1,\ldots,\frac{c+p-b(u-2s)}{2c}+1;-e^{2cz}\Bigg)+$$

$$e^{(p+b(u-2s))z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(c+p+b(u-2s))^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\Bigg(\frac{c+p+b(u-2s)}{2c},\ldots,\frac{c+p+b(u-2s)}{2c},$$

$$1;\frac{c+p+b(u-2s)}{2c}+1,\ldots,\frac{c+p+b(u-2s)}{2c}+1;-e^{2cz}\Bigg)\Bigg)+2^{-m-u+1}e^{cz}n!$$

$$\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}\Bigg((-1)^u e^{(a\,i(m-2k)+p-b(u-2s))z-\frac{i m\pi}{2}}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(c+a\,i(m-2k)+p-b(u-2s))^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{c+i\,a(m-2k)+p+b(2s-u)}{2c},\ldots,\frac{c+i\,a(m-2k)+p+b(2s-u)}{2c},1;$$

$$\frac{c+i\,a(m-2k)+p+b(2s-u)}{2c}+1,\ldots,\frac{c+i\,a(m-2k)+p+b(2s-u)}{2c}+1;-e^{2cz}\Bigg)+$$

$$(-1)^u e^{\frac{i\pi m}{2}+(-i\,a(m-2k)+p-b(u-2s))z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(c-i\,a(m-2k)+p-b(u-2s))^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{c+2i\,a k-i\,a m+p+2bs-bu}{2c},\ldots,\frac{c+2i\,a k-i\,a m+p+2bs-bu}{2c},1;$$

$$\frac{c+2i\,a k-i\,a m+p+2bs-bu}{2c}+1,\ldots,\frac{c+2i\,a k-i\,a m+p+2bs-bu}{2c}+1;-e^{2cz}\Bigg)+$$

$$e^{\frac{i\pi m}{2}+(-i\,a(m-2k)+p+b(u-2s))z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(c-i\,a(m-2k)+p+b(u-2s))^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{c-i\,a(m-2k)+p+b(u-2s)}{2c},\ldots,\frac{c-i\,a(m-2k)+p+b(u-2s)}{2c},1;$$

$$\frac{c-i\,a(m-2k)+p+b(u-2s)}{2c}+1,\ldots,\frac{c-i\,a(m-2k)+p+b(u-2s)}{2c}+1;-e^{2cz}\Bigg)+$$

$$e^{(a\,i(m-2k)+p+b(u-2s))z-\frac{i m\pi}{2}}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(c+a\,i(m-2k)+p+b(u-2s))^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{c+i\,a(m-2k)+p+b(u-2s)}{2c},\ldots,$$

$$\frac{c+i\,a(m-2k)+p+b(u-2s)}{2c},1;\frac{c+i\,a(m-2k)+p+b(u-2s)}{2c}+$$

$$1,\ldots,\frac{c+i\,a(m-2k)+p+b(u-2s)}{2c}+1;-e^{2cz}\Bigg)\Bigg)\,/;\,n\in\mathbb{N}\bigwedge m\in\mathbb{N}^+\bigwedge u\in\mathbb{N}^+$$

Involving cos, sinh, exp and power

## Involving $z^n e^{p z} \cos(a z) \sinh(b z) \operatorname{sech}(c z)$

01.24.21.0283.01

$$\int z^n e^{p z} \cos(a z) \sinh(b z) \operatorname{sech}(c z) \, dz = \frac{1}{2} e^{c z} n! \left( -e^{(-b-i a+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-b-i a+p+c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left( \frac{c+p-i a-b}{2 c}, \ldots, \frac{c+p-i a-b}{2 c}, 1; \frac{c+p-i a-b}{2 c}+1, \ldots, \frac{c+p-i a-b}{2 c}+1; -e^{2 c z} \right) + e^{(b+i a+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b+i a+p+c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left( \frac{c+p+i a+b}{2 c}, \ldots, \frac{c+p+i a+b}{2 c}, 1; \frac{c+p+i a+b}{2 c}+1, \ldots, \frac{c+p+i a+b}{2 c}+1; -e^{2 c z} \right) + e^{(b-i a+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b-i a+p+c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left( \frac{c+p-i a+b}{2 c}, \ldots, \frac{c+p-i a+b}{2 c}, 1; \frac{c+p-i a+b}{2 c}+1, \ldots, \frac{c+p-i a+b}{2 c}+1; -e^{2 c z} \right) - e^{(-b+i a+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-b+i a+p+c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left( \frac{c+p+i a-b}{2 c}, \ldots, \frac{c+p+i a-b}{2 c}, 1; \frac{c+p+i a-b}{2 c}+1, \ldots, \frac{c+p+i a-b}{2 c}+1; -e^{2 c z} \right) \right) /; n \in \mathbb{N}$$

Involving powers of cos, powers of sinh, exp and power

## Involving $z^n e^{p z} \cos^m(a z) \sinh^u(b z) \operatorname{sech}(c z)$

01.24.21.0284.01

$$\int z^n e^{p z} \cos^m(a z) \sinh^u(b z) \operatorname{sech}(c z) \, dz = i^u 2^{1-m-u} e^{(p+c) z} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! (1 - m \bmod 2) (1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left( \frac{c+p}{2 c}, \ldots, \frac{c+p}{2 c}, 1; \frac{c+p}{2 c}+1, \ldots, \frac{c+p}{2 c}+1; -e^{2 c z} \right) - i^u 2^{1-m-u} \binom{u}{\frac{u}{2}} (u \bmod 2 - 1) n! e^{c z} \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \left( e^{(p+a i (m-2 s)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+a i (m-2 s)+c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left( \frac{p+a i (m-2 s)+c}{2 c}, \ldots, \frac{p+a i (m-2 s)+c}{2 c}, 1; \frac{p+a i (m-2 s)+c}{2 c}+1, \ldots, \frac{p+a i (m-2 s)+c}{2 c}+1; -e^{2 c z} \right) + e^{(p-i a (m-2 s)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p-i a (m-2 s)+c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left( \frac{p-i a (m-2 s)+c}{2 c}, \ldots, \frac{p-i a (m-2 s)+c}{2 c}, \right.$$

$$1;\ \frac{p-i\,a\,(m-2\,s)+c}{2\,c}+1,\ \ldots,\ \frac{p-i\,a\,(m-2\,s)+c}{2\,c}+1;\ -e^{2\,c\,z}\Bigg)\Bigg)+\ 2^{1-m-u}\binom{m}{\frac{m}{2}}(1-m \bmod 2)$$

$$n!\,e^{c\,z}\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\Bigg(e^{(p+b\,(u-2\,k))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(p+b\,(u-2\,k)+c)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\Bigg(\frac{p+b\,(u-2\,k)+c}{2\,c},$$

$$\ldots,\ \frac{p+b\,(u-2\,k)+c}{2\,c},\ 1;\ \frac{p+b\,(u-2\,k)+c}{2\,c}+1,\ \ldots,\ \frac{p+b\,(u-2\,k)+c}{2\,c}+1;\ -e^{2\,c\,z}\Bigg)+$$

$$(-1)^u\,e^{(p-b\,(u-2\,k))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(p-b\,(u-2\,k)+c)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\Bigg(\frac{p-b\,(u-2\,k)+c}{2\,c},\ \ldots,$$

$$\frac{p-b\,(u-2\,k)+c}{2\,c},\ 1;\ \frac{p-b\,(u-2\,k)+c}{2\,c}+1,\ \ldots,\ \frac{p-b\,(u-2\,k)+c}{2\,c}+1;\ -e^{2\,c\,z}\Bigg)\Bigg)+$$

$$2^{1-m-u}\,n!\,e^{c\,z}\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{s}\binom{u}{k}\Bigg((-1)^u\,e^{(p-i\,a\,(m-2\,s)-b\,(u-2\,k))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(p-i\,a\,(m-2\,s)-b\,(u-2\,k)+c)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{p-i\,a\,(m-2\,s)-b\,(u-2\,k)+c}{2\,c},\ \ldots,\ \frac{p-i\,a\,(m-2\,s)-b\,(u-2\,k)+c}{2\,c},\ 1;$$

$$\frac{p-i\,a\,(m-2\,s)-b\,(u-2\,k)+c}{2\,c}+1,\ \ldots,\ \frac{p-i\,a\,(m-2\,s)-b\,(u-2\,k)+c}{2\,c}+1;\ -e^{2\,c\,z}\Bigg)+$$

$$e^{(p+a\,i\,(m-2\,s)+b\,(u-2\,k))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(p+a\,i\,(m-2\,s)+b\,(u-2\,k)+c)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{p+a\,i\,(m-2\,s)+b\,(u-2\,k)+c}{2\,c},\ \ldots,\ \frac{p+a\,i\,(m-2\,s)+b\,(u-2\,k)+c}{2\,c},\ 1;$$

$$\frac{p+a\,i\,(m-2\,s)+b\,(u-2\,k)+c}{2\,c}+1,\ \ldots,\ \frac{p+a\,i\,(m-2\,s)+b\,(u-2\,k)+c}{2\,c}+1;\ -e^{2\,c\,z}\Bigg)+$$

$$e^{(p-i\,a\,(m-2\,s)+b\,(u-2\,k))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(p-i\,a\,(m-2\,s)+b\,(u-2\,k)+c)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{p-i\,a\,(m-2\,s)+b\,(u-2\,k)+c}{2\,c},\ \ldots,\ \frac{p-i\,a\,(m-2\,s)+b\,(u-2\,k)+c}{2\,c},\ 1;$$

$$\frac{p-i\,a\,(m-2\,s)+b\,(u-2\,k)+c}{2\,c}+1,\ \ldots,\ \frac{p-i\,a\,(m-2\,s)+b\,(u-2\,k)+c}{2\,c}+1;\ -e^{2\,c\,z}\Bigg)+$$

$$(-1)^u\,e^{(p+a\,i\,(m-2\,s)-b\,(u-2\,k))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(p+a\,i\,(m-2\,s)-b\,(u-2\,k)+c)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{p+a\,i\,(m-2\,s)-b\,(u-2\,k)+c}{2\,c},\ \ldots,\ \frac{p+a\,i\,(m-2\,s)-b\,(u-2\,k)+c}{2\,c},$$

$$1;\ \frac{p+a\,i\,(m-2\,s)-b\,(u-2\,k)+c}{2\,c}+1,\ \ldots,$$

$$\frac{p+a\,i\,(m-2\,s)-b\,(u-2\,k)+c}{2\,c}+1;\ -e^{2\,c\,z}\Bigg)\Bigg)\ /;\ n\in\mathbb{N}\land m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

Involving sin, cosh, exp and power

## Involving $z^n e^{p z} \sin(a z) \cosh(b z) \operatorname{sech}(c z)$

01.24.21.0285.01

$$\int z^n e^{p z} \sin(a z) \cosh(b z) \operatorname{sech}(c z)\, dz = \frac{1}{2} e^{c z} n! \Bigg( e^{\frac{i\pi}{2}+(-b-i a+p) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (-b+c-i a+p)^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{-i a-b+c+p}{2 c}, \ldots, \frac{-i a-b+c+p}{2 c}, 1; \frac{-i a-b+c+p}{2 c}+1, \ldots, \frac{-i a-b+c+p}{2 c}+1; -e^{2 c z}\right) - e^{\frac{i\pi}{2}+(-b+i a+p) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (-b+c+i a+p)^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{i a-b+c+p}{2 c}, \ldots, \frac{i a-b+c+p}{2 c}, 1; \frac{i a-b+c+p}{2 c}+1, \ldots, \frac{i a-b+c+p}{2 c}+1; -e^{2 c z}\right) - e^{-\frac{1}{2}(i\pi)+(b-i a+p) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (b+c-i a+p)^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{-i a+b+c+p}{2 c}, \ldots, \frac{-i a+b+c+p}{2 c}, 1; \frac{-i a+b+c+p}{2 c}+1, \ldots, \frac{-i a+b+c+p}{2 c}+1; -e^{2 c z}\right) + e^{-\frac{1}{2}(i\pi)+(b+i a+p) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (b+c+i a+p)^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{i a+b+c+p}{2 c}, \ldots, \frac{i a+b+c+p}{2 c}, 1; \frac{i a+b+c+p}{2 c}+1, \ldots, \frac{i a+b+c+p}{2 c}+1; -e^{2 c z}\right)\Bigg) /; n \in \mathbb{N}$$

Involving powers of sin, powers of cosh, exp and power

## Involving $z^n e^{p z} \sin^m(a z) \cosh^u(b z) \operatorname{sech}(c z)$

01.24.21.0286.01

$$\int z^n e^{p z} \sin^m(a z) \cosh^u(b z) \operatorname{sech}(c z)\, dz = 2^{1-m-u} e^{(p+c) z} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! \,(1-m \bmod 2)\,(1-u \bmod 2) \left(\sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+c)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{p+c}{2 c}, \ldots, \frac{p+c}{2 c}, 1; \frac{p+c}{2 c}+1, \ldots, \frac{p+c}{2 c}+1; -e^{2 c z}\right)\right) + 2^{1-m-u} \binom{u}{\frac{u}{2}} n! \,(1-u \bmod 2)\, e^{c z} \sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor} (-1)^k \binom{m}{k} \Bigg( e^{(a i (m-2 k)+p) z-\frac{i m \pi}{2}} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (a i (m-2 k)+p+c)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{a i (m-2 k)+p+c}{2 c}, \ldots, \frac{a i (m-2 k)+p+c}{2 c}, 1; \frac{a i (m-2 k)+p+c}{2 c}+1, \ldots, \frac{a i (m-2 k)+p+c}{2 c}+1; -e^{2 c z}\right) +$$

$$e^{\frac{i\pi m}{2}+(p-i\,a\,(m-2\,k))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(-i\,a\,(m-2\,k)+p+c)^{-j-1}}{(n-j)!}\;{}_{j+2}F_{j+1}\Bigg(\frac{-i\,a\,(m-2\,k)+p+c}{2\,c},\,\ldots,$$

$$\frac{-i\,a\,(m-2\,k)+p+c}{2\,c},\,1;\;\frac{-i\,a\,(m-2\,k)+p+c}{2\,c}+1,\,\ldots,\;\frac{-i\,a\,(m-2\,k)+p+c}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)\Bigg)-$$

$$2^{1-m-u}\binom{m}{\frac{m}{2}}(m\bmod 2-1)\,n!\;e^{c\,z}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\Bigg(e^{(p+b\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(p+b\,(u-2\,s)+c)^{-j-1}}{(n-j)!}\;{}_{j+2}F_{j+1}\Bigg(\frac{p+b\,(u-2\,s)+c}{2\,c},$$

$$\ldots,\;\frac{p+b\,(u-2\,s)+c}{2\,c},\,1;\;\frac{p+b\,(u-2\,s)+c}{2\,c}+1,\,\ldots,\;\frac{p+b\,(u-2\,s)+c}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+$$

$$e^{(p-b\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(p-b\,(u-2\,s)+c)^{-j-1}}{(n-j)!}\;{}_{j+2}F_{j+1}\Bigg(\frac{p-b\,(u-2\,s)+c}{2\,c},\,\ldots,\;\frac{p-b\,(u-2\,s)+c}{2\,c},$$

$$1;\;\frac{p-b\,(u-2\,s)+c}{2\,c}+1,\,\ldots,\;\frac{p-b\,(u-2\,s)+c}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)\Bigg)+$$

$$2^{1-m-u}\;n!\;e^{c\,z}\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\binom{u}{s}\Bigg(e^{(a\,i\,(m-2\,k)+p-b\,(u-2\,s))\,z-\frac{i\,m\,\pi}{2}}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(a\,i\,(m-2\,k)+p-b\,(u-2\,s)+c)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{a\,i\,(m-2\,k)+p+b\,(2\,s-u)+c}{2\,c},\,\ldots,\;\frac{a\,i\,(m-2\,k)+p+b\,(2\,s-u)+c}{2\,c},\,1;$$

$$\frac{a\,i\,(m-2\,k)+p+b\,(2\,s-u)+c}{2\,c}+1,\,\ldots,\;\frac{a\,i\,(m-2\,k)+p+b\,(2\,s-u)+c}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+$$

$$e^{\frac{i\pi m}{2}+(-i\,a\,(m-2\,k)+p+b\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(-i\,a\,(m-2\,k)+p+b\,(u-2\,s)+c)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{-i\,a\,(m-2\,k)+p+b\,(u-2\,s)+c}{2\,c},\,\ldots,\;\frac{-i\,a\,(m-2\,k)+p+b\,(u-2\,s)+c}{2\,c},\,1;$$

$$\frac{-i\,a\,(m-2\,k)+p+b\,(u-2\,s)+c}{2\,c}+1,\,\ldots,\;\frac{-i\,a\,(m-2\,k)+p+b\,(u-2\,s)+c}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+$$

$$e^{\frac{i\pi m}{2}+(-i\,a\,(m-2\,k)+p-b\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(-i\,a\,(m-2\,k)+p-b\,(u-2\,s)+c)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{2\,i\,a\,k-i\,a\,m+p+2\,b\,s-b\,u+c}{2\,c},\,\ldots,\;\frac{2\,i\,a\,k-i\,a\,m+p+2\,b\,s-b\,u+c}{2\,c},\,1;$$

$$\frac{2\,i\,a\,k-i\,a\,m+p+2\,b\,s-b\,u+c}{2\,c}+1,\,\ldots,\;\frac{2\,i\,a\,k-i\,a\,m+p+2\,b\,s-b\,u+c}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+$$

$$e^{(a\,i\,(m-2\,k)+p+b\,(u-2\,s))\,z-\frac{i\,m\,\pi}{2}}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(a\,i\,(m-2\,k)+p+b\,(u-2\,s)+c)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{a\,i\,(m-2k)+p+b\,(u-2s)+c}{2c}, \ldots, \frac{a\,i\,(m-2k)+p+b\,(u-2s)+c}{2c}, 1; \frac{a\,i\,(m-2k)+p+b\,(u-2s)+c}{2c}+1, \ldots, \frac{a\,i\,(m-2k)+p+b\,(u-2s)+c}{2c}+1; -e^{2cz}\right)\Bigg) /; n \in \mathbb{N} \land m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

Involving cos, cosh, exp and power

## Involving $z^n\, e^{p z} \cos(a z) \cosh(b z) \operatorname{sech}(c z)$

01.24.21.0287.01

$$\int z^n e^{p z} \cos(a z) \cosh(b z) \operatorname{sech}(c z)\, dz = \frac{1}{2} e^{c z} n! \Bigg(e^{(-b-i a+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-b-i a+p+c)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c+p-i a-b}{2c}, \ldots, \frac{c+p-i a-b}{2c}, 1; \frac{c+p-i a-b}{2c}+1, \ldots, \frac{c+p-i a-b}{2c}+1; -e^{2cz}\right) + e^{(b+i a+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b+i a+p+c)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c+p+i a+b}{2c}, \ldots, \frac{c+p+i a+b}{2c}, 1; \frac{c+p+i a+b}{2c}+1, \ldots, \frac{c+p+i a+b}{2c}+1; -e^{2cz}\right) + e^{(b-i a+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b-i a+p+c)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c+p-i a+b}{2c}, \ldots, \frac{c+p-i a+b}{2c}, 1; \frac{c+p-i a+b}{2c}+1, \ldots, \frac{c+p-i a+b}{2c}+1; -e^{2cz}\right) + e^{(-b+i a+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-b+i a+p+c)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c+p+i a-b}{2c}, \ldots, \frac{c+p+i a-b}{2c}, 1; \frac{c+p+i a-b}{2c}+1, \ldots, \frac{c+p+i a-b}{2c}+1; -e^{2cz}\right)\Bigg) /; n \in \mathbb{N}$$

Involving powers of cos, powers of cosh, exp and power

## Involving $z^n\, e^{p z} \cos^m(a z) \cosh^u(b z) \operatorname{sech}(c z)$

01.24.21.0288.01

$$\int z^n e^{p z} \cos^m(a z) \cosh^u(b z) \operatorname{sech}(c z)\, dz = 2^{-m-u+1} e^{(c+p) z} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! (1 - m \bmod 2)(1 - u \bmod 2) \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (p+c)^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c+p}{2c}, \ldots, \frac{c+p}{2c}, 1; \frac{c+p}{2c}+1, \ldots, \frac{c+p}{2c}+1; -e^{2cz}\right) - 2^{-m-u+1} \binom{u}{\frac{u}{2}} (u \bmod 2 - 1)\, n!\, e^{c z} \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \Bigg(e^{(p-i a (m-2s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c+p-i a (m-2s))^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c+p-i a (m-2s)}{2c},\right.$$

$$\ldots,\ \frac{c+p-i\,a\,(m-2\,s)}{2\,c},\ 1;\ \frac{c+p-i\,a\,(m-2\,s)}{2\,c}+1,\ \ldots,\ \frac{c+p-i\,a\,(m-2\,s)}{2\,c}+1;\ -e^{2\,c\,z}\Bigg)+$$

$$e^{(p+a\,i\,(m-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(c+p+a\,i\,(m-2\,s))^{-j-1}\right)}{(n-j)!}\ {}_{j+2}F_{j+1}\Bigg(\frac{c+p+i\,a\,(m-2\,s)}{2\,c},\ \ldots,$$

$$\frac{c+p+i\,a\,(m-2\,s)}{2\,c},\ 1;\ \frac{c+p+i\,a\,(m-2\,s)}{2\,c}+1,\ \ldots,\ \frac{c+p+i\,a\,(m-2\,s)}{2\,c}+1;\ -e^{2\,c\,z}\Bigg)\Bigg)+2^{-m-u+1}\,e^{c\,z}$$

$$\binom{m}{\frac{m}{2}}\,n!\,(1-m\bmod 2)\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\Bigg(e^{(p-b\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(c+p-b\,(u-2\,s))^{-j-1}\right)}{(n-j)!}\ {}_{j+2}F_{j+1}\Bigg(\frac{c+p-b\,(u-2\,s)}{2\,c},$$

$$\ldots,\ \frac{c+p-b\,(u-2\,s)}{2\,c},\ 1;\ \frac{c+p-b\,(u-2\,s)}{2\,c}+1,\ \ldots,\ \frac{c+p-b\,(u-2\,s)}{2\,c}+1;\ -e^{2\,c\,z}\Bigg)+$$

$$e^{(p+b\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(c+p+b\,(u-2\,s))^{-j-1}\right)}{(n-j)!}\ {}_{j+2}F_{j+1}\Bigg(\frac{c+p+b\,(u-2\,s)}{2\,c},\ \ldots,$$

$$\frac{c+p+b\,(u-2\,s)}{2\,c},\ 1;\ \frac{c+p+b\,(u-2\,s)}{2\,c}+1,\ \ldots,\ \frac{c+p+b\,(u-2\,s)}{2\,c}+1;\ -e^{2\,c\,z}\Bigg)\Bigg)+$$

$$2^{-m-u+1}\,e^{c\,z}\,n!\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\binom{u}{s}\Bigg(e^{(-i\,a\,(m-2\,k)+p-b\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(c-i\,a\,(m-2\,k)+p-b\,(u-2\,s))^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{c-i\,a\,(m-2\,k)+p-b\,(u-2\,s)}{2\,c},\ \ldots,\ \frac{c-i\,a\,(m-2\,k)+p-b\,(u-2\,s)}{2\,c},\ 1;$$

$$\frac{c-i\,a\,(m-2\,k)+p-b\,(u-2\,s)}{2\,c}+1,\ \ldots,\ \frac{c-i\,a\,(m-2\,k)+p-b\,(u-2\,s)}{2\,c}+1;\ -e^{2\,c\,z}\Bigg)+$$

$$e^{(a\,i\,(m-2\,k)+p-b\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(c+a\,i\,(m-2\,k)+p-b\,(u-2\,s))^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{c+i\,a\,(m-2\,k)+p-b\,(u-2\,s)}{2\,c},\ \ldots,\ \frac{c+i\,a\,(m-2\,k)+p-b\,(u-2\,s)}{2\,c},\ 1;$$

$$\frac{c+i\,a\,(m-2\,k)+p-b\,(u-2\,s)}{2\,c}+1,\ \ldots,\ \frac{c+i\,a\,(m-2\,k)+p-b\,(u-2\,s)}{2\,c}+1;\ -e^{2\,c\,z}\Bigg)+$$

$$e^{(-i\,a\,(m-2\,k)+p+b\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(c-i\,a\,(m-2\,k)+p+b\,(u-2\,s))^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{c-i\,a\,(m-2\,k)+p+b\,(u-2\,s)}{2\,c},\ \ldots,\ \frac{c-i\,a\,(m-2\,k)+p+b\,(u-2\,s)}{2\,c},\ 1;$$

$$\frac{c-i\,a\,(m-2\,k)+p+b\,(u-2\,s)}{2\,c}+1,\ \ldots,\ \frac{c-i\,a\,(m-2\,k)+p+b\,(u-2\,s)}{2\,c}+1;\ -e^{2\,c\,z}\Bigg)+$$

$$e^{(a\,i\,(m-2\,k)+p+b\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(c+a\,i\,(m-2\,k)+p+b\,(u-2\,s))^{-j-1}\right)}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\left(\frac{c+i\,a\,(m-2\,k)+p+b\,(u-2\,s)}{2\,c}, \ldots, \frac{c+i\,a\,(m-2\,k)+p+b\,(u-2\,s)}{2\,c}, 1; \frac{c+i\,a\,(m-2\,k)+p+b\,(u-2\,s)}{2\,c}+1, \ldots, \frac{c+i\,a\,(m-2\,k)+p+b\,(u-2\,s)}{2\,c}+1; -e^{2\,c\,z}\right)\Bigg) /; n\in\mathbb{N}\bigwedge m\in\mathbb{N}^{+}\bigwedge u\in\mathbb{N}^{+} $$

Involving sin, tanh, exp and power

## Involving $z^n\, e^{p\,z} \sin(a\,z) \tanh(c\,z) \operatorname{sech}(c\,z)$

01.24.21.0289.01

$$ \int z^n\, e^{p\,z} \sin(a\,z) \tanh(c\,z) \operatorname{sech}(c\,z)\, dz = e^{2\,c\,z}\, n!\Bigg(-e^{\frac{i\,\pi}{2}+(-c-i\,a+p)\,z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c-i\,a+p)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{-i\,a+c+p}{2\,c}, \ldots, \frac{-i\,a+c+p}{2\,c}, 2; \frac{-i\,a+c+p}{2\,c}+1, \ldots, \frac{-i\,a+c+p}{2\,c}+1; -e^{2\,c\,z}\right) + e^{\frac{i\,\pi}{2}+(-c+i\,a+p)\,z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c+i\,a+p)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{i\,a+c+p}{2\,c}, \ldots, \frac{i\,a+c+p}{2\,c}, 2; \frac{i\,a+c+p}{2\,c}+1, \ldots, \frac{i\,a+c+p}{2\,c}+1; -e^{2\,c\,z}\right) - e^{-\frac{1}{2}(i\,\pi)+(c-i\,a+p)\,z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (3\,c-i\,a+p)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{-i\,a+3\,c+p}{2\,c}, \ldots, \frac{-i\,a+3\,c+p}{2\,c}, 2; \frac{-i\,a+3\,c+p}{2\,c}+1, \ldots, \frac{-i\,a+3\,c+p}{2\,c}+1; -e^{2\,c\,z}\right) + e^{-\frac{1}{2}(i\,\pi)+(c+i\,a+p)\,z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (3\,c+i\,a+p)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{i\,a+3\,c+p}{2\,c}, \ldots, \frac{i\,a+3\,c+p}{2\,c}, 2; \frac{i\,a+3\,c+p}{2\,c}+1, \ldots, \frac{i\,a+3\,c+p}{2\,c}+1; -e^{2\,c\,z}\right)\Bigg) /; n\in\mathbb{N} $$

Involving powers of sin, powers of tanh, exp and power

## Involving $z^n\, e^{p\,z} \sin^m(a\,z) \tanh^u(c\,z) \operatorname{sech}(c\,z)$

01.24.21.0290.01

$$ \int z^n\, e^{p\,z} \sin^m(a\,z) \tanh^u(c\,z) \operatorname{sech}(c\,z)\, dz = $$

$$ i^u\, 2^{1-m} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n!\, (1-m \bmod 2)\, (1-u \bmod 2)\, e^{(p+c\,(u+1))\,z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} ((u+1)\,c+p)^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{p+c\,(u+1)}{2\,c}, \ldots, \frac{p+c\,(u+1)}{2\,c}, u+1; \frac{p+c\,(u+1)}{2\,c}+1, \ldots, \frac{p+c\,(u+1)}{2\,c}+1; -e^{2\,c\,z}\right) + $$

$$ i^{m+u}\, 2^{1-m} \binom{u}{\frac{u}{2}} (1-u \bmod 2)\, n!\, e^{c\,(u+1)\,z} \sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor} (-1)^k \binom{m}{k} \Bigg(e^{(p-i\,a\,(m-2\,k))\,z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} ((u+1)\,c+a\,i\,(2\,k-m)+p)^{-j-1}\right)}{(n-j)!} $$

$$ {}_{j+2}F_{j+1}\left(\frac{i\,a\,(2\,k-m)+p+c\,(u+1)}{2\,c},\,\ldots,\,\frac{i\,a\,(2\,k-m)+p+c\,(u+1)}{2\,c},\,u+1;\right.$$
$$\left.\frac{i\,a\,(2\,k-m)+p+c\,(u+1)}{2\,c}+1,\,\ldots,\,\frac{i\,a\,(2\,k-m)+p+c\,(u+1)}{2\,c}+1;\,-e^{2\,c\,z}\right)+$$
$$(-1)^m\,e^{(a\,i\,(m-2\,k)+p)\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,((u+1)\,c+a\,i\,(m-2\,k)+p)^{-j-1}\right)}{(n-j)!}$$
$$ {}_{j+2}F_{j+1}\left(\frac{i\,a\,(m-2\,k)+p+c\,(u+1)}{2\,c},\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(u+1)}{2\,c},\,u+1;\right.$$
$$\left.\left.\frac{i\,a\,(m-2\,k)+p+c\,(u+1)}{2\,c}+1,\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(u+1)}{2\,c}+1;\,-e^{2\,c\,z}\right)\right)+$$
$$2^{1-m}\binom{m}{\frac{m}{2}}(1-m\bmod 2)\,n!\,e^{c\,(u+1)\,z}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}\left((-1)^u\,e^{(p-c\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,((2\,s+1)\,c+p)^{-j-1}\right)}{(n-j)!}\right.$$
$$ {}_{j+2}F_{j+1}\left(\frac{1}{2}\left(\frac{p}{c}+2\,s+1\right),\,\ldots,\,\frac{1}{2}\left(\frac{p}{c}+2\,s+1\right),\,u+1;\,\frac{1}{2}\left(\frac{p}{c}+2\,s+1\right)+1,\,\ldots,\,\frac{1}{2}\left(\frac{p}{c}+2\,s+1\right)+1;\,-e^{2\,c\,z}\right)+$$
$$e^{(p+c\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,((-2\,s+2\,u+1)\,c+p)^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{1}{2}\left(\frac{p}{c}-2\,s+2\,u+1\right),\,\ldots,\,\frac{1}{2}\left(\frac{p}{c}-2\,s+2\,u+1\right),\right.$$
$$\left.\left.u+1;\,\frac{1}{2}\left(\frac{p}{c}-2\,s+2\,u+1\right)+1,\,\ldots,\,\frac{1}{2}\left(\frac{p}{c}-2\,s+2\,u+1\right)+1;\,-e^{2\,c\,z}\right)\right)+2^{1-m}\,n!\,e^{c\,(u+1)\,z}$$
$$\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}\left((-1)^u\,e^{\frac{i\,\pi\,m}{2}+(-i\,a\,(m-2\,k)+p-c\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(2\,s\,c+c+2\,i\,a\,k-i\,a\,m+p)^{-j-1}\right)}{(n-j)!}\right.$$
$$ {}_{j+2}F_{j+1}\left(\frac{2\,s\,c+c+2\,i\,a\,k-i\,a\,m+p}{2\,c},\,\ldots,\,\frac{2\,s\,c+c+2\,i\,a\,k-i\,a\,m+p}{2\,c},\,u+\right.$$
$$\left.1;\,\frac{2\,s\,c+c+2\,i\,a\,k-i\,a\,m+p}{2\,c}+1,\,\ldots,\,\frac{2\,s\,c+c+2\,i\,a\,k-i\,a\,m+p}{2\,c}+1;\,-e^{2\,c\,z}\right)+$$
$$(-1)^u\,e^{(a\,i\,(m-2\,k)+p-c\,(u-2\,s))\,z-\frac{i\,m\,\pi}{2}}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(2\,s\,c+c-2\,i\,a\,k+i\,a\,m+p)^{-j-1}\right)}{(n-j)!}$$
$$ {}_{j+2}F_{j+1}\left(\frac{2\,s\,c+c-2\,i\,a\,k+i\,a\,m+p}{2\,c},\,\ldots,\,\frac{2\,s\,c+c-2\,i\,a\,k+i\,a\,m+p}{2\,c},\,u+\right.$$
$$\left.1;\,\frac{2\,s\,c+c-2\,i\,a\,k+i\,a\,m+p}{2\,c}+1,\,\ldots,\,\frac{2\,s\,c+c-2\,i\,a\,k+i\,a\,m+p}{2\,c}+1;\,-e^{2\,c\,z}\right)+$$
$$e^{\frac{i\,\pi\,m}{2}+(-i\,a\,(m-2\,k)+p+c\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,((-2\,s+2\,u+1)\,c+a\,i\,(2\,k-m)+p)^{-j-1}\right)}{(n-j)!}$$
$$ {}_{j+2}F_{j+1}\left(\frac{i\,a\,(2\,k-m)+p+c\,(-2\,s+2\,u+1)}{2\,c},\,\ldots,\,\frac{i\,a\,(2\,k-m)+p+c\,(-2\,s+2\,u+1)}{2\,c},\,u+1;\right.$$
$$\left.\frac{i\,a\,(2\,k-m)+p+c\,(-2\,s+2\,u+1)}{2\,c}+1,\,\ldots,\,\frac{i\,a\,(2\,k-m)+p+c\,(-2\,s+2\,u+1)}{2\,c}+1;\,-e^{2\,c\,z}\right)+$$

$$e^{(a\,i\,(m-2k)+p+c\,(u-2s))\,z-\frac{i\,m\,\pi}{2}} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} \left((-2s+2u+1)\,c+a\,i\,(m-2k)+p\right)^{-j-1}\right)}{(n-j)!}$$
$$\,_{j+2}F_{j+1}\left(\frac{i\,a\,(m-2k)+p+c\,(-2s+2u+1)}{2c}, \ldots, \frac{i\,a\,(m-2k)+p+c\,(-2s+2u+1)}{2c},\right.$$
$$u+1;\, \frac{i\,a\,(m-2k)+p+c\,(-2s+2u+1)}{2c}+1, \ldots,$$
$$\left.\left.\frac{i\,a\,(m-2k)+p+c\,(-2s+2u+1)}{2c}+1;\, -e^{2cz}\right)\right) /;\, n \in \mathbb{N} \bigwedge m \in \mathbb{N}^+ \bigwedge u \in \mathbb{N}^+$$

Involving cos, tanh, exp and power

## Involving $z^n\, e^{p\,z} \cos(a\,z) \tanh(c\,z) \operatorname{sech}(c\,z)$

01.24.21.0291.01

$$\int z^n e^{p\,z} \cos(a\,z) \tanh(c\,z) \operatorname{sech}(c\,z)\, dz = e^{2cz}\, n! \left(-e^{(-c-i\,a+p)\,z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c-i\,a+p)^{-j-1}}{(n-j)!}\right.$$
$$\,_{j+2}F_{j+1}\left(\frac{-i\,a+c+p}{2c}, \ldots, \frac{-i\,a+c+p}{2c}, 2;\, \frac{-i\,a+c+p}{2c}+1, \ldots, \frac{-i\,a+c+p}{2c}+1;\, -e^{2cz}\right) - e^{(-c+i\,a+p)\,z}$$
$$\sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c+i\,a+p)^{-j-1}}{(n-j)!}\, \,_{j+2}F_{j+1}\left(\frac{i\,a+c+p}{2c}, \ldots, \frac{i\,a+c+p}{2c}, 2;\, \frac{i\,a+c+p}{2c}+1, \ldots, \frac{i\,a+c+p}{2c}+1;\, -e^{2cz}\right) +$$
$$e^{(c-i\,a+p)\,z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (3c-i\,a+p)^{-j-1}}{(n-j)!}\, \,_{j+2}F_{j+1}\left(\frac{-i\,a+3c+p}{2c}, \ldots, \frac{-i\,a+3c+p}{2c}, 2;\right.$$
$$\left.\frac{-i\,a+3c+p}{2c}+1, \ldots, \frac{-i\,a+3c+p}{2c}+1;\, -e^{2cz}\right) + e^{(c+i\,a+p)\,z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (3c+i\,a+p)^{-j-1}}{(n-j)!}$$
$$\left.\,_{j+2}F_{j+1}\left(\frac{i\,a+3c+p}{2c}, \ldots, \frac{i\,a+3c+p}{2c}, 2;\, \frac{i\,a+3c+p}{2c}+1, \ldots, \frac{i\,a+3c+p}{2c}+1;\, -e^{2cz}\right)\right) /;\, n \in \mathbb{N}$$

Involving powers of cos, powers of tanh, exp and power

## Involving $z^n\, e^{p\,z} \cos^m(a\,z) \tanh^u(c\,z) \operatorname{sech}(c\,z)$

01.24.21.0292.01

$$\int z^n e^{p\,z} \cos^m(a\,z) \tanh^u(c\,z) \operatorname{sech}(c\,z)\, dz =$$
$$i^u\, 2^{1-m} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n!\, (1-m \bmod 2)\,(1-u \bmod 2)\, e^{(p+c\,(1+u))\,z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+c\,(1+u))^{-j-1}}{(n-j)!}$$
$$\,_{j+2}F_{j+1}\left(\frac{c\,(1+u)+p}{2c}, \ldots, \frac{c\,(1+u)+p}{2c}, 1+u;\, \frac{c\,(1+u)+p}{2c}+1, \ldots, \frac{c\,(1+u)+p}{2c}+1;\, -e^{2cz}\right) -$$

$$i^u\, 2^{1-m} \binom{u}{\frac{u}{2}} (u \bmod 2 - 1)\, n!\, e^{c(1+u)z} \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \left( e^{(p+a i (m-2s))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p + a i (m-2s) + c(1+u))^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1} \right.$$

$$\left( \frac{c(1+u) + i a (m-2s) + p}{2c}, \ldots, \frac{c(1+u) + i a (m-2s) + p}{2c}, 1+u; \frac{c(1+u) + i a (m-2s) + p}{2c} + 1, \ldots, \right.$$

$$\left. \frac{c(1+u) + i a (m-2s) + p}{2c} + 1; -e^{2cz} \right) + e^{(p - i a (m-2s))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p - i a (m-2s) + c(1+u))^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left( \frac{c(1+u) + p - i a (m-2s)}{2c}, \ldots, \frac{c(1+u) + p - i a (m-2s)}{2c}, 1+u; \right.$$

$$\left. \left. \frac{c(1+u) + p - i a (m-2s)}{2c} + 1, \ldots, \frac{c(1+u) + p - i a (m-2s)}{2c} + 1; -e^{2cz} \right) \right) +$$

$$2^{1-m} \binom{m}{\frac{m}{2}} (1 - m \bmod 2)\, n!\, e^{c(1+u)z} \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{u}{k} \left( e^{(p + c(u-2k))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p + c(1 + 2u - 2k))^{-j-1}}{(n-j)!} \right.$$

$${}_{j+2}F_{j+1}\left( \frac{p + c(-2k + 2u + 1)}{2c}, \ldots, \frac{p + c(-2k + 2u + 1)}{2c}, 1+u; \frac{p + c(-2k + 2u + 1)}{2c} + 1, \ldots, \right.$$

$$\left. \frac{p + c(-2k + 2u + 1)}{2c} + 1; -e^{2cz} \right) + (-1)^u e^{(p - c(u-2k))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p + c(1+2k))^{-j-1}}{(n-j)!}$$

$$\left. {}_{j+2}F_{j+1}\left( \frac{p + c(2k+1)}{2c}, \ldots, \frac{p + c(2k+1)}{2c}, 1+u; \frac{p + c(2k+1)}{2c} + 1, \ldots, \frac{p + c(2k+1)}{2c} + 1; -e^{2cz} \right) \right) +$$

$$2^{1-m}\, n!\, e^{c(1+u)z} \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{s} \binom{u}{k} \left( (-1)^u e^{(p - i a (m-2s) - c(u-2k))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p - i a\ (m-2s) + c(2k+1))^{-j-1}}{(n-j)!} \right.$$

$${}_{j+2}F_{j+1}\left( \frac{p - i a\ (m-2s) + c(2k+1)}{2c}, \ldots, \frac{p - i a\ (m-2s) + c(2k+1)}{2c}, 1+u; \right.$$

$$\left. \frac{p - i a\ (m-2s) + c(2k+1)}{2c} + 1, \ldots, \frac{p - i a\ (m-2s) + c(2k+1)}{2c} + 1; -e^{2cz} \right) +$$

$$e^{(p + a i (m-2s) + c(u-2k))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p + i a\ (m-2s) + c(-2k + 2u + 1))^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left( \frac{p + i a\ (m-2s) + c(-2k + 2u + 1)}{2c}, \ldots, \frac{p + i a\ (m-2s) + c(-2k + 2u + 1)}{2c}, 1+u; \right.$$

$$\left. \frac{p + i a\ (m-2s) + c(-2k + 2u + 1)}{2c} + 1, \ldots, \frac{p + i a\ (m-2s) + c(-2k + 2u + 1)}{2c} + 1; -e^{2cz} \right) +$$

$$e^{(p - i a (m-2s) + c(u-2k))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p - i a\ (m-2s) + c(-2k + 2u + 1))^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left( \frac{p - i a\ (m-2s) + c(-2k + 2u + 1)}{2c}, \ldots, \frac{p - i a\ (m-2s) + c(-2k + 2u + 1)}{2c}, 1+u; \right.$$

$$\frac{p-i\,a\,(m-2s)+c\,(-2k+2u+1)}{2c}+1,\,\ldots,\,\frac{p-i\,a\,(m-2s)+c\,(-2k+2u+1)}{2c}+1;\,-e^{2cz}\Bigg)+$$

$$(-1)^u\,e^{(p+a\,i\,(m-2s)-c\,(u-2k))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(p+i\,a\,(m-2s)+c\,(2k+1))^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}$$

$$\Bigg(\frac{p+i\,a\,(m-2s)+c\,(2k+1)}{2c},\,\ldots,\,\frac{p+i\,a\,(m-2s)+c\,(2k+1)}{2c},\,1+u;\,\frac{p+i\,a\,(m-2s)+c\,(2k+1)}{2c}+$$

$$1,\,\ldots,\,\frac{p+i\,a\,(m-2s)+c\,(2k+1)}{2c}+1;\,-e^{2cz}\Bigg)\Bigg)\Bigg)\,/;\,n\in\mathbb{N}\wedge m\in\mathbb{N}^+\wedge u\in\mathbb{N}^+$$

## Involving powers of sin, powers of coth, exp and power

### Involving $z^n\,e^{p\,z}\,\sin^m(a\,z)\,\coth^u(c\,z)\,\mathrm{sech}(c\,z)$

01.24.21.0293.01

$$\int z^n\,e^{p\,z}\,\sin^m(a\,z)\,\coth^u(c\,z)\,\mathrm{sech}(c\,z)\,dz = (-1)^u\,2^{1-m}\binom{m}{\frac{m}{2}}n!\,(1-m\bmod 2)\Bigg(e^{(p+c\,u)\,z}\binom{u-1}{\frac{u-1}{2}}(1-(u-1)\bmod 2)$$

$$\sum_{j=0}^{n}\frac{(-1)^j\,(p+c\,u)^{-j-1}\,z^{n-j}}{(n-j)!}\,{}_{j+2}F_{j+1}\Bigg(\frac{p+c\,u}{2c},\,\ldots,\,\frac{p+c\,u}{2c},\,u;\,\frac{p+c\,u}{2c}+1,\,\ldots,\,\frac{p+c\,u}{2c}+1;\,e^{2cz}\Bigg)+$$

$$e^{c\,u\,z}\sum_{k=0}^{\left\lfloor\frac{u-2}{2}\right\rfloor}\binom{u-1}{k}\Bigg(e^{(p-c\,(-2k+u-1))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,((2k+1)\,c+p)^{-j-1}\,z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{c\,(2k+1)+p}{2c},\,\ldots,\,\frac{c\,(2k+1)+p}{2c},\,u;\,\frac{c\,(2k+1)+p}{2c}+1,\,\ldots,\,\frac{c\,(2k+1)+p}{2c}+1;\,e^{2cz}\Bigg)+$$

$$e^{((-2k+u-1)\,c+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,((-2k+2u-1)\,c+p)^{-j-1}\,z^{n-j}}{(n-j)!}\,{}_{j+2}F_{j+1}\Bigg(\frac{p+c\,(-2k+2u-1)}{2c},\,\ldots,$$

$$\frac{p+c\,(-2k+2u-1)}{2c},\,u;\,\frac{p+c\,(-2k+2u-1)}{2c}+1,\,\ldots,\,\frac{p+c\,(-2k+2u-1)}{2c}+1;\,e^{2cz}\Bigg)\Bigg)\Bigg)+$$

$$(-1)^u\,2^{1-m}\,n!\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^s\binom{m}{s}\Bigg(e^{\frac{i\,m\,\pi}{2}}\Bigg(e^{(-i\,a\,(m-2s)+p+c\,u)\,z}\binom{u-1}{\frac{u-1}{2}}(1-(u-1)\bmod 2)$$

$$\sum_{j=0}^{n}\frac{(-1)^j\,(-i\,a\,(m-2s)+p+c\,u)^{-j-1}\,z^{n-j}}{(n-j)!}\,{}_{j+2}F_{j+1}\Bigg(\frac{p-i\,a\,(m-2s)+c\,u}{2c},\,\ldots,$$

$$\frac{p-i\,a\,(m-2s)+c\,u}{2c},\,u;\,\frac{p-i\,a\,(m-2s)+c\,u}{2c}+1,\,\ldots,\,\frac{p-i\,a\,(m-2s)+c\,u}{2c}+1;\,e^{2cz}\Bigg)+$$

$$e^{c\,u\,z}\sum_{k=0}^{\left\lfloor\frac{u-2}{2}\right\rfloor}\binom{u-1}{k}\Bigg(e^{(-(-2k+u-1)\,c-i\,a\,(m-2s)+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,((2k+1)\,c-i\,a\,(m-2s)+p)^{-j-1}\,z^{n-j}}{(n-j)!}$$

$$
{}_{j+2}F_{j+1}\left(\frac{c(2k+1)+p-i\,a(m-2s)}{2c},\ldots,\frac{c(2k+1)+p-i\,a(m-2s)}{2c},u;\right.
$$
$$
\left.\frac{c(2k+1)+p-i\,a(m-2s)}{2c}+1,\ldots,\frac{c(2k+1)+p-i\,a(m-2s)}{2c}+1;e^{2cz}\right)+
$$
$$
e^{((-2k+u-1)c-i\,a(m-2s)+p)z}\sum_{j=0}^{n}\frac{(-1)^j((-2k+2u-1)c-i\,a(m-2s)+p)^{-j-1}z^{n-j}}{(n-j)!}
$$
$$
{}_{j+2}F_{j+1}\left(\frac{p-i\,a(m-2s)+c(-2k+2u-1)}{2c},\ldots,\right.
$$
$$
\frac{p-i\,a(m-2s)+c(-2k+2u-1)}{2c},u;\frac{p-i\,a(m-2s)+c(-2k+2u-1)}{2c}+1,
$$
$$
\left.\left.\left.\ldots,\frac{p-i\,a(m-2s)+c(-2k+2u-1)}{2c}+1;e^{2cz}\right)\right)\right)+
$$

$$
e^{-\frac{1}{2}i\,m\pi}\left(e^{(a\,i(m-2s)+p+c\,u)z}\binom{u-1}{\frac{u-1}{2}}(1-(u-1)\bmod 2)\sum_{j=0}^{n}\frac{(-1)^j(a\,i(m-2s)+p+c\,u)^{-j-1}z^{n-j}}{(n-j)!}\right.
$$
$$
{}_{j+2}F_{j+1}\left(\frac{p+i\,a(m-2s)+c\,u}{2c},\ldots,\frac{p+i\,a(m-2s)+c\,u}{2c},u;\right.
$$
$$
\left.\frac{p+i\,a(m-2s)+c\,u}{2c}+1,\ldots,\frac{p+i\,a(m-2s)+c\,u}{2c}+1;e^{2cz}\right)+
$$
$$
e^{c\,u\,z}\sum_{k=0}^{\left\lfloor\frac{u-2}{2}\right\rfloor}\binom{u-1}{k}\left(e^{(-(-2k+u-1)c+a\,i(m-2s)+p)z}\sum_{j=0}^{n}\frac{(-1)^j((2k+1)c+a\,i(m-2s)+p)^{-j-1}z^{n-j}}{(n-j)!}\right.
$$
$$
{}_{j+2}F_{j+1}\left(\frac{c(2k+1)+p+i\,a(m-2s)}{2c},\ldots,\frac{c(2k+1)+p+i\,a(m-2s)}{2c},u;\right.
$$
$$
\left.\frac{c(2k+1)+p+i\,a(m-2s)}{2c}+1,\ldots,\frac{c(2k+1)+p+i\,a(m-2s)}{2c}+1;e^{2cz}\right)+
$$
$$
e^{((-2k+u-1)c+a\,i(m-2s)+p)z}\sum_{j=0}^{n}\frac{(-1)^j((-2k+2u-1)c+a\,i(m-2s)+p)^{-j-1}z^{n-j}}{(n-j)!}
$$
$$
{}_{j+2}F_{j+1}\left(\frac{p+i\,a(m-2s)+c(-2k+2u-1)}{2c},\ldots,\frac{p+i\,a(m-2s)+c(-2k+2u-1)}{2c},\right.
$$
$$
u;\frac{p+i\,a(m-2s)+c(-2k+2u-1)}{2c}+1,\ldots,
$$
$$
\left.\left.\left.\left.\frac{p+i\,a(m-2s)+c(-2k+2u-1)}{2c}+1;e^{2cz}\right)\right)\right)\right)/;n\in\mathbb{N}\land m\in\mathbb{N}^+\land u\in\mathbb{N}^+
$$

## Involving powers of cos, powers of coth, exp and power

## Involving $z^n e^{p z} \cos^m(a z) \coth^u(c z) \operatorname{sech}(c z)$

01.24.21.0294.01

$$\int z^n e^{p z} \cos^m(a z) \coth^u(c z) \operatorname{sech}(c z)\, dz = (-1)^u 2^{1-m} \binom{m}{\frac{m}{2}} n! \,(1 - m \bmod 2) \Bigg( e^{(p+c u) z} \binom{u-1}{\frac{u-1}{2}} (1 - (u-1) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (p + c u)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{p+c u}{2 c}, \ldots, \frac{p+c u}{2 c}, u; \frac{p+c u}{2 c} + 1, \ldots, \frac{p+c u}{2 c} + 1; e^{2 c z}\right) + e^{c u z} \sum_{k=0}^{\left\lfloor \frac{u-2}{2} \right\rfloor} \binom{u-1}{k} \Bigg( e^{(p - c(-2 k+u-1)) z} \sum_{j=0}^{n} \frac{(-1)^j ((2 k+1) c + p)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c(2 k+1)+p}{2 c}, \ldots, \frac{c(2 k+1)+p}{2 c}, u; \frac{c(2 k+1)+p}{2 c} + 1, \ldots, \frac{c(2 k+1)+p}{2 c} + 1; e^{2 c z}\right) + e^{((-2 k+u-1) c+p) z} \sum_{j=0}^{n} \frac{(-1)^j ((-2 k+2 u-1) c + p)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{p+c(-2 k+2 u-1)}{2 c}, \ldots, \frac{p+c(-2 k+2 u-1)}{2 c}, u; \frac{p+c(-2 k+2 u-1)}{2 c} + 1, \ldots, \frac{p+c(-2 k+2 u-1)}{2 c} + 1; e^{2 c z}\right)\Bigg)\Bigg) +$$

$$(-1)^u 2^{1-m} n! \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \Bigg( e^{(-i a (m-2 s)+p+c u) z} \binom{u-1}{\frac{u-1}{2}} (1 - (u-1) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (-i a (m-2 s) + p + c u)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{p - i a (m-2 s) + c u}{2 c}, \ldots, \frac{p - i a (m-2 s) + c u}{2 c}, u; \frac{p - i a (m-2 s) + c u}{2 c} + 1, \ldots, \frac{p - i a (m-2 s) + c u}{2 c} + 1; e^{2 c z}\right) + e^{(a i (m-2 s)+p+c u) z} \binom{u-1}{\frac{u-1}{2}} (1 - (u-1) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (a i (m-2 s) + p + c u)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{p + i a (m-2 s) + c u}{2 c}, \ldots, \frac{p + i a (m-2 s) + c u}{2 c}, u; \frac{p + i a (m-2 s) + c u}{2 c} + 1, \ldots, \frac{p + i a (m-2 s) + c u}{2 c} + 1; e^{2 c z}\right) + e^{c u z} \sum_{k=0}^{\left\lfloor \frac{u-2}{2} \right\rfloor} \binom{u-1}{k} \Bigg( e^{(-(-2 k+u-1) c - i a (m-2 s)+p) z} \sum_{j=0}^{n} \frac{(-1)^j ((2 k+1) c - i a (m-2 s) + p)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c(2 k+1) + p - i a (m-2 s)}{2 c}, \ldots, \frac{c(2 k+1) + p - i a (m-2 s)}{2 c}, u; \frac{c(2 k+1) + p - i a (m-2 s)}{2 c} + 1, \ldots, \frac{c(2 k+1) + p - i a (m-2 s)}{2 c} + 1; e^{2 c z}\right) + e^{((-2 k+u-1) c - i a (m-2 s)+p) z} \sum_{j=0}^{n} \frac{(-1)^j ((-2 k+2 u-1) c - i a (m-2 s) + p)^{-j-1} z^{n-j}}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\left(\frac{p - i\,a\,(m-2s) + c\,(-2k+2u-1)}{2c}, \ldots, \frac{p - i\,a\,(m-2s) + c\,(-2k+2u-1)}{2c}, u; \frac{p - i\,a\,(m-2s) + c\,(-2k+2u-1)}{2c} + 1, \ldots, \frac{p - i\,a\,(m-2s) + c\,(-2k+2u-1)}{2c} + 1; e^{2cz}\right)\Bigg) + $$

$$ e^{c\,u\,z} \sum_{k=0}^{\left\lfloor \frac{u-2}{2} \right\rfloor} \binom{u-1}{k} \Bigg( e^{(-(-2k+u-1)c + a\,i\,(m-2s)+p)z} \sum_{j=0}^{n} \frac{(-1)^j\,((2k+1)c + a\,i\,(m-2s)+p)^{-j-1} z^{n-j}}{(n-j)!} $$

$$ {}_{j+2}F_{j+1}\left(\frac{c\,(2k+1) + p + i\,a\,(m-2s)}{2c}, \ldots, \frac{c\,(2k+1) + p + i\,a\,(m-2s)}{2c}, u; \frac{c\,(2k+1) + p + i\,a\,(m-2s)}{2c} + 1, \ldots, \frac{c\,(2k+1) + p + i\,a\,(m-2s)}{2c} + 1; e^{2cz}\right) + $$

$$ e^{((-2k+u-1)c + a\,i\,(m-2s)+p)z} \sum_{j=0}^{n} \frac{(-1)^j\,((-2k+2u-1)c + a\,i\,(m-2s)+p)^{-j-1} z^{n-j}}{(n-j)!} $$

$$ {}_{j+2}F_{j+1}\left(\frac{p + i\,a\,(m-2s) + c\,(-2k+2u-1)}{2c}, \ldots, \frac{p + i\,a\,(m-2s) + c\,(-2k+2u-1)}{2c}, u; \frac{p + i\,a\,(m-2s) + c\,(-2k+2u-1)}{2c} + 1, \ldots, \frac{p + i\,a\,(m-2s) + c\,(-2k+2u-1)}{2c} + 1; e^{2cz}\right)\Bigg)\Bigg) /; n \in \mathbb{N} \land m \in \mathbb{N}^+ \land u \in \mathbb{N}^+ $$

#### Involving functions of the direct function

## Involving powers of the direct function

### Involving powers of sech

### Linear argument

01.24.21.0295.02

$$ \int \operatorname{sech}^{\nu}(c\,z)\,dz = \frac{\cosh^2(c\,z)^{\frac{\nu-1}{2}} \operatorname{sech}^{\nu-1}(c\,z) \sinh(c\,z)}{c} \, {}_2F_1\left(\frac{1}{2}, \frac{\nu+1}{2}; \frac{3}{2}; -\sinh^2(c\,z)\right) $$

01.24.21.0296.01

$$ \int \operatorname{sech}^2(c\,z)\,dz = \frac{\tanh(c\,z)}{c} $$

01.24.21.0297.01

$$ \int \operatorname{sech}^3(c\,z)\,dz = \frac{2\tan^{-1}\left(\tanh\left(\frac{c\,z}{2}\right)\right) + \operatorname{sech}(c\,z)\tanh(c\,z)}{2c} $$

01.24.21.0298.01

$$\int \operatorname{sech}^4(c\,z)\,dz = \frac{\left(\operatorname{sech}^2(c\,z)+2\right)\tanh(c\,z)}{3\,c}$$

01.24.21.0299.01

$$\int \operatorname{sech}^5(c\,z)\,dz = \frac{2\tanh(c\,z)\operatorname{sech}^3(c\,z)+3\tanh(c\,z)\operatorname{sech}(c\,z)+6\tan^{-1}\!\left(\tanh\!\left(\frac{c\,z}{2}\right)\right)}{8\,c}$$

01.24.21.0300.01

$$\int \operatorname{sech}^6(c\,z)\,dz = \frac{\left(3\operatorname{sech}^4(c\,z)+4\operatorname{sech}^2(c\,z)+8\right)\tanh(c\,z)}{15\,c}$$

01.24.21.0301.01

$$\int \operatorname{sech}^7(c\,z)\,dz = \frac{8\tanh(c\,z)\operatorname{sech}^5(c\,z)+10\tanh(c\,z)\operatorname{sech}^3(c\,z)+15\tanh(c\,z)\operatorname{sech}(c\,z)+30\tan^{-1}\!\left(\tanh\!\left(\frac{c\,z}{2}\right)\right)}{48\,c}$$

01.24.21.0302.01

$$\int \operatorname{sech}^8(c\,z)\,dz = \frac{\left(5\operatorname{sech}^6(c\,z)+6\operatorname{sech}^4(c\,z)+8\operatorname{sech}^2(c\,z)+16\right)\tanh(c\,z)}{35\,c}$$

01.24.21.0617.01

$$\int \operatorname{sech}^{2n}(c\,z)\,dz = \frac{\operatorname{sech}^{2n-1}(c\,z)\sinh(c\,z)}{c\,(2\,n-1)}\sum_{k=0}^{n-1}\frac{\cosh^{2k}(c\,z)\,(1-n)_k}{\left(\frac{3}{2}-n\right)_k}\;/;\;n\in\mathbb{N}^+$$

01.24.21.0618.01

$$\int \operatorname{sech}^{2n+1}(c\,z)\,dz = \frac{\left(\frac{1}{2}\right)_n}{2\,c\,n!}\left(4\tan^{-1}\!\left(\tanh\!\left(\frac{c\,z}{2}\right)\right)+\sinh(c\,z)\sum_{k=1}^{n}\frac{\operatorname{sech}^{2k}(c\,z)\,(k-1)!}{\left(\frac{1}{2}\right)_k}\right)\;/;\;n\in\mathbb{N}$$

01.24.21.0619.01

$$\int \operatorname{sech}^{2n}(c\,z)\,dz = \frac{\sin(c\,z)\sec^{2n-1}(c\,z)}{c\,(2\,n-1)}\;{}_2F_1\!\left(1,\,1-n;\,\frac{3}{2}-n;\,\cos^2(c\,z)\right)\;/;\;n\in\mathbb{N}^+$$

01.24.21.0620.01

$$\int \sec^{2n+1}(c\,z)\,dz = \frac{\left(\frac{1}{2}\right)_n}{c\,n!}\left(2\tan^{-1}\!\left(\tanh\!\left(\frac{c\,z}{2}\right)\right)+\sin^{-1}(\operatorname{sech}(c\,z))\coth(c\,z)\sqrt{\tanh^2(c\,z)}\right)-$$
$$\frac{\operatorname{sech}^{2n+2}(c\,z)\sinh(c\,z)}{(2\,n+1)\,c}\;{}_2F_1\!\left(1,\,n+1;\,n+\frac{3}{2};\,\operatorname{sech}^2(c\,z)\right)\;/;\;n\in\mathbb{N}$$

01.24.21.0303.01

$$\int \operatorname{sech}^{\frac{1}{2}}(c\,z)\,dz = -\frac{2\,i\cosh^{\frac{1}{2}}(c\,z)\,F\!\left(\frac{i\,c\,z}{2}\,\middle|\,2\right)\operatorname{sech}^{\frac{1}{2}}(c\,z)}{c}$$

01.24.21.0304.01

$$\int \frac{1}{\operatorname{sech}^{\frac{1}{2}}(c\,z)}\,dz = -\frac{2\,i\,E\!\left(\frac{i\,c\,z}{2}\,\middle|\,2\right)}{c\cosh^{\frac{1}{2}}(c\,z)\operatorname{sech}^{\frac{1}{2}}(c\,z)}$$

01.24.21.0305.01

$$\int \operatorname{sech}^{12}(c z)\, dz = \frac{\left(63 \operatorname{sech}^{10}(c z)+70 \operatorname{sech}^{8}(c z)+80 \operatorname{sech}^{6}(c z)+96 \operatorname{sech}^{4}(c z)+128 \operatorname{sech}^{2}(c z)+256\right) \tanh(c z)}{693 c}$$

## Involving products of the direct functions

01.24.21.0306.01

$$\int \operatorname{sech}(b+a z) \operatorname{sech}(a z)\, dz = -\frac{\operatorname{csch}(b) (\log(\cosh(a z))-\log(\cosh(b+a z)))}{a}$$

01.24.21.0307.01

$$\int \operatorname{sech}(b-a z) \operatorname{sech}(a z)\, dz = \frac{\operatorname{csch}(b) (\log(\cosh(a z))-\log(\cosh(b-a z)))}{a}$$

## Involving rational functions of the direct function

### Involving $(a+b \operatorname{sech}(z))^{-n}$

01.24.21.0308.01

$$\int \frac{1}{a+b \operatorname{sech}(z)}\, dz = \frac{1}{a}\left(z+\frac{2 b}{\sqrt{a^2-b^2}} \tan^{-1}\left(\frac{b-a}{\sqrt{a^2-b^2}} \tanh\left(\frac{z}{2}\right)\right)\right)$$

01.24.21.0309.01

$$\int \frac{1}{(a+b \operatorname{sech}(z))^2}\, dz = \frac{(b+a \cosh(z)) \operatorname{sech}(z)}{a^2 (a+b \operatorname{sech}(z))^2}\left(\frac{a \tanh(z)\, b^2}{a^2-b^2}-\frac{2 b \left(b^2-2 a^2\right) (b+a \cosh(z)) \operatorname{sech}(z)}{\left(a^2-b^2\right)^{3/2}} \tan^{-1}\left(\frac{(b-a) \tanh\left(\frac{z}{2}\right)}{\sqrt{a^2-b^2}}\right)+z (a+b \operatorname{sech}(z))\right)$$

### Involving $\left(a+b \operatorname{sech}^2(z)\right)^{-n}$

01.24.21.0310.01

$$\int \frac{1}{a+b \operatorname{sech}^2(z)}\, dz = \frac{1}{a}\left(z-\frac{\sqrt{b}}{\sqrt{a+b}} \tanh^{-1}\left(\frac{\sqrt{b}\, \tanh(z)}{\sqrt{a+b}}\right)\right)$$

01.24.21.0311.01

$$\int \frac{1}{\left(a+b \operatorname{sech}^2(z)\right)^2}\, dz = \frac{1}{8 a^2 \left(b \operatorname{sech}^2(z)+a\right)^2} (\cosh(2 z)\, a+a+2 b) \operatorname{sech}^4(z) \left(2 z (\cosh(2 z)\, a+a+2 b)-\frac{\sqrt{b}\, (3 a+2 b)\, (\cosh(2 z)\, a+a+2 b)}{(a+b)^{3/2}} \tanh^{-1}\left(\frac{\sqrt{b}\, \tanh(z)}{\sqrt{a+b}}\right)-\frac{a b \sinh(2 z)}{a+b}\right)$$

## Involving algebraic functions of the direct function

### Involving $(a+b \operatorname{sech}(c z))^{\beta}$

01.24.21.0312.01

$$\int \operatorname{sech}(c z)\,(a+b\operatorname{sech}(c z))^{\beta}\,dz = -\frac{\sqrt{2}\,\coth\left(\frac{c z}{2}\right)(\operatorname{sech}(c z)-1)\,(a+b\operatorname{sech}(c z))^{\beta}\left(\frac{a+b\operatorname{sech}(c z)}{a+b}\right)^{-\beta}}{c\sqrt{\operatorname{sech}(c z)+1}}\,F_1\!\left(\frac{1}{2};\frac{1}{2},-\beta;\frac{3}{2};\frac{1}{2}(1-\operatorname{sech}(c z)),\frac{b-b\operatorname{sech}(c z)}{a+b}\right)$$

01.24.21.0313.01

$$\int \operatorname{sech}(c z)\sqrt{a+b\operatorname{sech}(c z)}\,dz = -\left(2\cosh(c z)\coth\left(\frac{c z}{2}\right)\sqrt{a+b\operatorname{sech}(c z)}\left(\sqrt{-\frac{a+b}{b}}\,(\operatorname{sech}(c z)+1)(a+b\operatorname{sech}(c z))-2\,i\,(a+b)\sqrt{-\coth^2\left(\frac{c z}{2}\right)}\,E\!\left(i\sinh^{-1}\!\left(\frac{\sqrt{-\frac{a+b}{b}}}{\sqrt{1-\operatorname{sech}(c z)}}\right)\middle|\,\frac{2b}{a+b}\right)\sqrt{1-\operatorname{sech}(c z)}\,\operatorname{sech}(c z)\sqrt{\frac{a+b\operatorname{sech}(c z)}{b\operatorname{sech}(c z)-b}}\,\sinh^2\left(\frac{c z}{2}\right)\right)\right)\Bigg/\left(\sqrt{-\frac{a+b}{b}}\,c\,(b+a\cosh(c z))(\operatorname{sech}(c z)+1)\right)$$

01.24.21.0314.01

$$\int \frac{\operatorname{sech}(c z)}{\sqrt{a+b\operatorname{sech}(c z)}}\,dz = \frac{\left(-\coth^2\left(\frac{c z}{2}\right)\right)^{3/2}(1-\operatorname{sech}(c z))^{3/2}\tanh\left(\frac{c z}{2}\right)}{c\,(\operatorname{sech}(c z)+1)\sqrt{a+b\operatorname{sech}(c z)}}\sqrt{-\frac{(b+a\cosh(c z))\operatorname{csch}^2\left(\frac{c z}{2}\right)}{b}}\,F\!\left(\sin^{-1}\!\left(\frac{\sqrt{2}}{\sqrt{1-\operatorname{sech}(c z)}}\right)\middle|\,\frac{a+b}{2b}\right)$$

## Involving $((a+b\operatorname{sech}(c z))^n)^{\beta}$

01.24.21.0315.01

$$\int \operatorname{sech}(c z)\,((a+b\operatorname{sech}(c z))^n)^{\beta}\,dz = -\frac{\sqrt{2}\,\coth\left(\frac{c z}{2}\right)(\operatorname{sech}(c z)-1)\left(\frac{a+b\operatorname{sech}(c z)}{a+b}\right)^{-n\beta}((a+b\operatorname{sech}(c z))^n)^{\beta}}{c\sqrt{\operatorname{sech}(c z)+1}}\,F_1\!\left(\frac{1}{2};\frac{1}{2},-n\beta;\frac{3}{2};\frac{1}{2}(1-\operatorname{sech}(c z)),\frac{b-b\operatorname{sech}(c z)}{a+b}\right)$$

01.24.21.0316.01

$$\int \operatorname{sech}(c\,z)\sqrt{(a+b\operatorname{sech}(c\,z))^3}\,dz ==$$

$$-\left(16\cosh^2\left(\frac{c\,z}{2}\right)\cosh^2(c\,z)\coth\left(\frac{c\,z}{2}\right)\sqrt{1-\operatorname{sech}(c\,z)}\sqrt{(a+b\operatorname{sech}(c\,z))^3}\left(b\,(\operatorname{sech}(c\,z)-1)\,(a+b\operatorname{sech}(c\,z))+\right.\right.$$

$$\frac{1}{\sqrt{\operatorname{sech}(c\,z)+1}\sqrt{\tanh^2(c\,z)}}\left(\sqrt{1-\operatorname{sech}(c\,z)}\left(-3\,F\left(\sin^{-1}\left(\frac{\sqrt{1-\operatorname{sech}(c\,z)}}{\sqrt{2}}\right)\middle|\frac{2\,b}{a+b}\right)\sqrt{\frac{a+b\operatorname{sech}(c\,z)}{a+b}}\right.\right.$$

$$\sqrt{\tanh^2(c\,z)}\,a^2-b^2\,F\left(\sin^{-1}\left(\frac{\sqrt{1-\operatorname{sech}(c\,z)}}{\sqrt{2}}\right)\middle|\frac{2\,b}{a+b}\right)\sqrt{\frac{a+b\operatorname{sech}(c\,z)}{a+b}}\sqrt{\tanh^2(c\,z)}\,+$$

$$\frac{1}{\sqrt{\frac{b\,(\operatorname{sech}(c\,z)+1)}{b-a}}}\left(4\,a\left((a+b)\,E\left(\sin^{-1}\left(\sqrt{\frac{a+b\operatorname{sech}(c\,z)}{a-b}}\right)\middle|\frac{a-b}{a+b}\right)-b\,F\left(\sin^{-1}\left(\sqrt{\frac{a+b\operatorname{sech}(c\,z)}{a-b}}\right)\middle|\right.\right.\right.$$

$$\left.\left.\left.\left.\left.\left.\frac{a-b}{a+b}\right)\right)(\operatorname{sech}(c\,z)+1)\sqrt{\frac{b-b\operatorname{sech}(c\,z)}{a+b}}\sqrt{\frac{a+b\operatorname{sech}(c\,z)}{a-b}}\right)\right)\right)\right)\Big/$$

$$\left(c\left(4\left(4\,a\,b\cosh(c\,z)+3\left(\cosh(2\,c\,z)\,a^2+a^2+2\,b^2\right)\right)\sqrt{1-\operatorname{sech}(c\,z)}\cosh^2\left(\frac{c\,z}{2}\right)+16\,a\,b\cosh^2(c\,z)\right.\right.$$

$$\left.\left.\sqrt{\operatorname{sech}(c\,z)+1}\sqrt{\tanh^2(c\,z)}\right)\right)$$

01.24.21.0317.01

$$\int \frac{\operatorname{sech}(c\,z)}{\sqrt{(a+b\operatorname{sech}(c\,z))^3}}\,dz ==$$

$$\left(2\coth\left(\frac{c\,z}{2}\right)\sqrt{\frac{a+b\operatorname{sech}(c\,z)}{a+b}}\left(b\sqrt{\frac{a+b\operatorname{sech}(c\,z)}{a+b}}\sqrt{\operatorname{sech}(c\,z)+1}\,(\operatorname{sech}(c\,z)-1)+(b+a\cosh(c\,z))\right.\right.$$

$$\left.\left.E\left(\sin^{-1}\left(\frac{\sqrt{1-\operatorname{sech}(c\,z)}}{\sqrt{2}}\right)\middle|\frac{2\,b}{a+b}\right)\sqrt{1-\operatorname{sech}(c\,z)}\operatorname{sech}(c\,z)\right)\right)\Big/\left((a-b)\,c\sqrt{\operatorname{sech}(c\,z)+1}\sqrt{(a+b\operatorname{sech}(c\,z))^3}\right)$$

## Involving $\left(a+b\operatorname{sech}^2(c\,z)\right)^\beta$

01.24.21.0318.01

$$\int \left(a+b\,\mathrm{sech}^2(c\,z)\right)^\beta \,dz = -\frac{\coth(c\,z)\left(b\,\mathrm{sech}^2(c\,z)+a\right)^\beta \sqrt{-\sinh^2(c\,z)}}{c\,(2\,\beta-1)}\,F_1\!\left(\frac{1}{2}-\beta;\,\frac{1}{2},\,-\beta;\,\frac{3}{2}-\beta;\,\cosh^2(c\,z),\,-\frac{a\cosh^2(c\,z)}{b}\right)\left(\frac{a\cosh^2(c\,z)}{b}+1\right)^{-\beta}$$

01.24.21.0319.01

$$\int \sqrt{a+b\,\mathrm{sech}^2(c\,z)}\,dz = \frac{1}{c\,(\cosh(2\,c\,z)\,a+a+2\,b)}\left(\sqrt{2}\,\cosh(c\,z)\left(\sqrt{a}\,\sqrt{\frac{\cosh(2\,c\,z)\,a+a+2\,b}{a+b}}\,\sqrt{a+b}\,\sinh^{-1}\!\left(\frac{\sqrt{a}\,\sinh(c\,z)}{\sqrt{a+b}}\right)+\sqrt{b}\,\tan^{-1}\!\left(\frac{\sqrt{2}\,\sqrt{b}\,\sinh(c\,z)}{\sqrt{\cosh(2\,c\,z)\,a+a+2\,b}}\right)\sqrt{\cosh(2\,c\,z)\,a+a+2\,b}\right)\sqrt{b\,\mathrm{sech}^2(c\,z)+a}\right)$$

01.24.21.0320.01

$$\int \frac{1}{\sqrt{a+b\,\mathrm{sech}^2(c\,z)}}\,dz = \frac{\sqrt{\cosh(2\,c\,z)\,a+a+2\,b}\,\mathrm{sech}(c\,z)}{\sqrt{2}\,\sqrt{a}\,c\,\sqrt{b\,\mathrm{sech}^2(c\,z)+a}}\tanh^{-1}\!\left(\frac{\sqrt{2}\,\sqrt{a}\,\sinh(c\,z)}{\sqrt{\cosh(2\,c\,z)\,a+a+2\,b}}\right)$$

01.24.21.0321.01

$$\int \mathrm{sech}(c\,z)\left(a+b\,\mathrm{sech}^2(c\,z)\right)^\beta dz = -\frac{\mathrm{csch}(c\,z)\left(b\,\mathrm{sech}^2(c\,z)+a\right)^\beta\left(\frac{b\,\mathrm{sech}^2(c\,z)}{a}+1\right)^{-\beta}\sqrt{\tanh^2(c\,z)}}{c}\,F_1\!\left(\frac{1}{2};\,\frac{1}{2},\,-\beta;\,\frac{3}{2};\,\mathrm{sech}^2(c\,z),\,-\frac{b\,\mathrm{sech}^2(c\,z)}{a}\right)$$

01.24.21.0322.01

$$\int \mathrm{sech}(c\,z)\sqrt{a+b\,\mathrm{sech}^2(c\,z)}\,dz = \frac{1}{2\,c\,(\cosh(2\,c\,z)\,a+a+2\,b)}\left(\sqrt{b\,\mathrm{sech}^2(c\,z)+a}\left(2\sqrt{2}\sqrt{\frac{\cosh(2\,c\,z)\,a+a+2\,b}{a+b}}\,(a+b)\,i\cosh(c\,z)\,E\!\left(i\,c\,z\,\middle|\,\frac{a}{a+b}\right)-2\,i\sqrt{2}\,(a+b)\cosh(c\,z)\sqrt{\frac{\cosh(2\,c\,z)\,a+a+2\,b}{a+b}}\,F\!\left(i\,c\,z\,\middle|\,\frac{a}{a+b}\right)+2\,(\cosh(2\,c\,z)\,a+a+2\,b)\sinh(c\,z)\right)\right)$$

01.24.21.0323.01

$$\int \frac{\mathrm{sech}(c\,z)}{\sqrt{a+b\,\mathrm{sech}^2(c\,z)}}\,dz = -\frac{i}{\sqrt{2}\,c\,\sqrt{b\,\mathrm{sech}^2(c\,z)+a}}\sqrt{\frac{\cosh(2\,c\,z)\,a+a+2\,b}{a+b}}\,F\!\left(i\,c\,z\,\middle|\,\frac{a}{a+b}\right)\mathrm{sech}(c\,z)$$

## Involving $\left(\left(a+b\,\mathrm{sech}^2(c\,z)\right)^n\right)^\beta$

01.24.21.0324.01

$$\int \left(\left(a+b\operatorname{sech}^2(c z)\right)^n\right)^\beta \, dz = -\frac{\left(\frac{a\cosh^2(c z)}{b}+1\right)^{-n\beta} \coth(c z)\left(\left(b\operatorname{sech}^2(c z)+a\right)^n\right)^\beta \sqrt{-\sinh^2(c z)}}{c\,(2 n\beta-1)} F_1\!\left(\frac{1}{2}-n\beta;\frac{1}{2},-n\beta;\frac{3}{2}-n\beta;\cosh^2(c z),-\frac{a\cosh^2(c z)}{b}\right)$$

01.24.21.0325.01

$$\int \sqrt{\left(a+b\operatorname{sech}^2(c z)\right)^3}\, dz = \frac{1}{c\,(\cosh(2 c z)\,a+a+2 b)^{3/2}} \left(\cosh(c z)\sqrt{\left(b\operatorname{sech}^2(c z)+a\right)^3}\left(2\sqrt{2}\tanh^{-1}\!\left(\frac{\sqrt{2}\sqrt{a}\sinh(c z)}{\sqrt{\cosh(2 c z)\,a+a+2 b}}\right)\cosh^2(c z)\,a^{3/2} + \sqrt{2}\sqrt{b}\,(3 a+b)\tan^{-1}\!\left(\frac{\sqrt{2}\sqrt{b}\sinh(c z)}{\sqrt{\cosh(2 c z)\,a+a+2 b}}\right)\cosh^2(c z)+b\sqrt{\cosh(2 c z)\,a+a+2 b}\,\sinh(c z)\right)\right)$$

01.24.21.0326.01

$$\int \frac{1}{\sqrt{\left(a+b\operatorname{sech}^2(c z)\right)^3}}\, dz = \left(\operatorname{sech}^2(c z)\left(\sqrt{2}\tanh^{-1}\!\left(\frac{\sqrt{2}\sqrt{a}\sinh(c z)}{\sqrt{\cosh(2 c z)\,a+a+2 b}}\right)(\cosh(2 c z)\,a+a+2 b)^{3/2}\operatorname{sech}(c z) - \frac{2\sqrt{a}\,b\,(\cosh(2 c z)\,a+a+2 b)\tanh(c z)}{a+b}\right)\right)\Big/\left(4 a^{3/2} c\sqrt{\left(b\operatorname{sech}^2(c z)+a\right)^3}\right)$$

01.24.21.0327.01

$$\int \operatorname{sech}(c z)\left(\left(a+b\operatorname{sech}^2(c z)\right)^n\right)^\beta \, dz = -\frac{\operatorname{csch}(c z)\left(\left(b\operatorname{sech}^2(c z)+a\right)^n\right)^\beta\left(\frac{b\operatorname{sech}^2(c z)}{a}+1\right)^{-n\beta}\sqrt{\tanh^2(c z)}}{c} F_1\!\left(\frac{1}{2};\frac{1}{2},-n\beta;\frac{3}{2};\operatorname{sech}^2(c z),-\frac{b\operatorname{sech}^2(c z)}{a}\right)$$

01.24.21.0328.01

$$\int \operatorname{sech}(c z)\sqrt{\left(a+b\operatorname{sech}^2(c z)\right)^3}\, dz = \frac{1}{3 c\,(\cosh(2 c z)\,a+a+2 b)^2} \left(2\cosh^3(c z)\sqrt{\left(b\operatorname{sech}^2(c z)+a\right)^3}\left(2\sqrt{2}\sqrt{\frac{\cosh(2 c z)\,a+a+2 b}{a+b}}\left(2 a^2+3 b a+b^2\right) i\, E\!\left(i c z \,\middle|\, \frac{a}{a+b}\right) - i\sqrt{2}\left(3 a^2+5 b a+2 b^2\right)\sqrt{\frac{\cosh(2 c z)\,a+a+2 b}{a+b}}\, F\!\left(i c z\,\middle|\,\frac{a}{a+b}\right) + \tanh(c z)\left(4 a^2+b\tanh^2(c z)\,a+11 b a+2(2 a+b)\cosh(2 c z)\,a+4 b^2+b(a+2 b)\operatorname{sech}^2(c z)\right)\right)\right)$$

01.24.21.0329.01

$$\int \frac{\operatorname{sech}(c z)}{\sqrt{\left(a+b \operatorname{sech}^2(c z)\right)^3}}\, dz = \left((\cosh(2 c z)\, a+a+2 b) \operatorname{sech}^3(c z) \left(\sqrt{2} \sqrt{\frac{\cosh(2 c z)\, a+a+2 b}{a+b}}\, (a+b)\, i\, E\!\left(i c z \,\middle|\, \frac{a}{a+b}\right) - i \sqrt{2}\, (a+b) \sqrt{\frac{\cosh(2 c z)\, a+a+2 b}{a+b}}\, F\!\left(i c z \,\middle|\, \frac{a}{a+b}\right) + a \sinh(2 c z)\right)\right) \Big/ \left(\sqrt{2}\, a\, (a+b)\, c \sqrt{(\cosh(2 c z)\, a+a+2 b)^3 \operatorname{sech}^6(c z)}\right)$$

**Involving functions of the direct function and a power function**

## Involving powers of the direct function and a power function

### Involving powers of sech and power

### Involving $z^n$ and linear arguments

01.24.21.0330.01

$$\int z^n \operatorname{sech}^\nu(c z)\, dz = n!\, \operatorname{sech}^\nu(c z) \left(1+e^{2 c z}\right)^\nu \sum_{j=0}^n \frac{(-1)^j z^{n-j}}{(n-j)!\, (c \nu)^{j+1}}\, {}_{j+2}F_{j+1}\!\left(\frac{\nu}{2}, \ldots, \frac{\nu}{2}, \nu; \frac{\nu}{2}+1, \ldots, \frac{\nu}{2}+1; -e^{2 c z}\right) /;\, n \in \mathbb{N}^+$$

01.24.21.0331.01

$$\int z \operatorname{sech}^\nu(c z)\, dz = \frac{1}{4 c^2 (\nu-1)} \left(\operatorname{sech}^{\nu-1}(c z) \left(2^\nu (\nu-1) \sqrt{\pi} \cosh(c z)\, \Gamma(1-\nu)\, {}_3\tilde{F}_2\!\left(1, 1-\frac{\nu}{2}, 1-\frac{\nu}{2}; \frac{3-\nu}{2}, 2-\frac{\nu}{2}; \cosh^2(c z)\right) + 4 c z\, {}_2F_1\!\left(1, 1-\frac{\nu}{2}; \frac{3-\nu}{2}; \cosh^2(c z)\right) \sinh(c z)\right)\right)$$

01.24.21.0332.01

$$\int z \operatorname{sech}^2(c z)\, dz = \frac{c z \tanh(c z) - \log(\cosh(c z))}{c^2}$$

01.24.21.0333.01

$$\int z \operatorname{sech}^3(c z)\, dz = -\frac{1}{2 c^2} \left(i \left(-c z \log\left(1+i e^{-c z}\right) + c z \log\left(1-i e^{-c z}\right) + \operatorname{Li}_2\left(-i e^{-c z}\right) - \operatorname{Li}_2\left(i e^{-c z}\right) + i \operatorname{sech}(c z) + c\, i\, z \operatorname{sech}(c z) \tanh(c z)\right)\right)$$

01.24.21.0334.01

$$\int z \operatorname{sech}^4(c z)\, dz = \frac{(2 c z \tanh(c z)+1) \operatorname{sech}^2(c z) - 4 \log(\cosh(c z)) + 4 c z \tanh(c z)}{6 c^2}$$

01.24.21.0335.01

$$\int z\,\mathrm{sech}^5(c\,z)\,dz = \frac{1}{24\,c^2}\left(6\,c\,z\tanh(c\,z)\,\mathrm{sech}^3(c\,z) + 2\,\mathrm{sech}^3(c\,z) + 9\,c\,z\tanh(c\,z)\,\mathrm{sech}(c\,z) + 9\,\mathrm{sech}(c\,z) + 9\,c\,i\,z\log(1 + i\,e^{-c\,z}) - 9\,c\,i\,z\log(1 - i\,e^{-c\,z}) - 9\,i\,\mathrm{Li}_2(-i\,e^{-c\,z}) + 9\,i\,\mathrm{Li}_2(i\,e^{-c\,z})\right)$$

01.24.21.0336.01

$$\int z^2\,\mathrm{sech}^2(c\,z)\,dz = \frac{\mathrm{Li}_2\left(-e^{-2\,c\,z}\right) + c\,z\left(-c\,z + c\tanh(c\,z)\,z - 2\log\left(1 + e^{-2\,c\,z}\right)\right)}{c^3}$$

01.24.21.0337.01

$$\int z^3\,\mathrm{sech}^3(c\,z)\,dz = -\frac{1}{128\,c^4}\Big(i\Big(-16\,c^4\,z^4 - 64\,c^3\log(1 + i\,e^{-c\,z})\,z^3 + 64\,c^3\log(1 + i\,e^{c\,z})\,z^3 + 64\,c^3\,i\,\mathrm{sech}(c\,z)\tanh(c\,z)\,z^3 - 32\,i\,c^3\,\pi\,z^3 + 24\,c^2\,\pi^2\,z^2 - 96\,i\,c^2\,\pi\log(1 + i\,e^{-c\,z})\,z^2 + 96\,c^2\,i\,\pi\log(1 - i\,e^{c\,z})\,z^2 + 192\,c^2\,\mathrm{Li}_2(-i\,e^{c\,z})\,z^2 + 192\,c^2\,i\,\mathrm{sech}(c\,z)\,z^2 + 8\,c\,i\,\pi^3\,z + 48\,c\,\pi^2\log(1 + i\,e^{-c\,z})\,z + 384\,c\log(1 + i\,e^{-c\,z})\,z - 384\,c\log(1 - i\,e^{-c\,z})\,z - 48\,c\,\pi^2\log(1 - i\,e^{c\,z})\,z + 192\,c\,i\,\pi\,\mathrm{Li}_2(i\,e^{c\,z})\,z + 384\,c\,\mathrm{Li}_3(-i\,e^{-c\,z})\,z - 384\,c\,\mathrm{Li}_3(-i\,e^{c\,z})\,z + 7\,\pi^4 + 8\,i\,\pi^3\log(1 + i\,e^{-c\,z}) - 8\,i\,\pi^3\log(1 + i\,e^{c\,z}) + 8\,i\,\pi^3\log\left(\cot\left(\frac{1}{4}(\pi - 2\,i\,c\,z)\right)\right) - 48\left(-4\,c^2\,z^2 - 4\,\pi\,i\,c\,z + \pi^2 + 8\right)\mathrm{Li}_2(-i\,e^{-c\,z}) + 384\,\mathrm{Li}_2(i\,e^{-c\,z}) - 48\,\pi^2\,\mathrm{Li}_2(i\,e^{c\,z}) + 192\,i\,\pi\,\mathrm{Li}_3(-i\,e^{-c\,z}) - 192\,i\,\pi\,\mathrm{Li}_3(i\,e^{c\,z}) + 384\,\mathrm{Li}_4(-i\,e^{-c\,z}) + 384\,\mathrm{Li}_4(-i\,e^{c\,z})\Big)\Big)$$

**Involving functions of the direct function and exponential function**

## Involving powers of the direct function and exponential function

### Involving exp

### Involving $e^{b\,z}$

01.24.21.0338.01

$$\int e^{b\,z}\,\mathrm{sech}^\nu(c\,z)\,dz = \frac{e^{b\,z}\,\mathrm{sech}^\nu(c\,z)\left(1 + e^{2\,c\,z}\right)^\nu}{b + c\,\nu}\,{}_2F_1\left(\frac{b + c\,\nu}{2\,c}, \nu; \frac{b + c\,\nu}{2\,c} + 1; -e^{2\,c\,z}\right)$$

01.24.21.0339.01

$$\int e^{-c\,\nu\,z}\,\mathrm{sech}^\nu(c\,z)\,dz = -\frac{e^{-c\,z\,\nu}\left(1 + e^{-2\,c\,z}\right)^\nu\,\mathrm{sech}^\nu(c\,z)}{2\,c\,\nu}\,{}_2F_1\left(\nu, \nu; \nu + 1; -e^{-2\,c\,z}\right)$$

01.24.21.0340.01

$$\int e^{c\,z}\,\mathrm{sech}^2(c\,z)\,dz = \frac{2\tan^{-1}(e^{c\,z})}{c} - \frac{2\,e^{c\,z}}{c\left(1 + e^{2\,c\,z}\right)}$$

01.24.21.0341.01

$$\int e^{2\,c\,z}\,\mathrm{sech}^2(c\,z)\,dz = \frac{2\log\left(1 + e^{2\,c\,z}\right)}{c} + \frac{2}{c\left(1 + e^{2\,c\,z}\right)}$$

01.24.21.0342.01

$$\int e^{2 c z} \operatorname{sech}^4(c z) \, dz = -\frac{8 \left(1 + 3 e^{2 c z} + 3 e^{4 c z}\right)}{3 c \left(1 + e^{2 c z}\right)^3}$$

01.24.21.0343.01

$$\int e^{-2 c z} \operatorname{sech}^4(c z) \, dz = \frac{8 e^{2 c z} \left(3 + 3 e^{2 c z} + e^{4 c z}\right)}{3 c \left(1 + e^{2 c z}\right)^3}$$

**Involving functions of the direct function, exponential and a power functions**

## Involving powers of the direct function, exponential and a power functions

### Involving exp and power

#### Involving $z^n e^{b z}$

01.24.21.0344.01

$$\int z^n e^{b z} \operatorname{sech}^\nu(c z) \, dz = n! \operatorname{sech}^\nu(c z) \left(1 + e^{2 c z}\right)^\nu e^{b z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j}}{(n-j)! \, (b + c \nu)^{j+1}} \, {}_{j+2}F_{j+1}\left(\frac{c \nu + b}{2 c}, \ldots, \frac{c \nu + b}{2 c}, \nu; \frac{c \nu + b}{2 c} + 1, \ldots, \frac{c \nu + b}{2 c} + 1; -e^{2 c z}\right) /; n \in \mathbb{N}^+$$

01.24.21.0345.01

$$\int z^n e^{-c \nu z} \operatorname{sech}^\nu(c z) \, dz = \frac{e^{-c \nu z} \left(1 + e^{2 c z}\right)^\nu z^{n+1} \operatorname{sech}^\nu(c z)}{n+1} - \nu e^{-c (\nu - 2) z} \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \, n! \sum_{j=0}^{n} \frac{\left((-1)^j (2 c)^{-j-1} z^{n-j}\right)}{(n-j)!} \, {}_{j+3}F_{j+2}\left(1, \ldots, 1, \nu + 1; 2, \ldots, 2; -e^{2 c z}\right) /; n \in \mathbb{N}^+$$

01.24.21.0346.01

$$\int z^n e^{-c z (2 q + \nu)} \operatorname{sech}^\nu(c z) \, dz = n! \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \left(\frac{(-1)^q e^{-c z \nu} \Gamma(q + \nu) z^{n+1}}{(n+1)! \, q! \, \Gamma(\nu)} + \frac{(-1)^q (\nu)_{q+1} e^{-c z (\nu - 2)}}{(q+1)!} \sum_{j=0}^{n} \frac{z^{n-j}}{(-2 c)^{j+1} (n-j)!} \, {}_{j+3}F_{j+2}\left(1, \ldots, 1, q + \nu + 1; 2, \ldots, 2, q + 2; -e^{2 c z}\right) - \sum_{j=0}^{n} \sum_{k=0}^{q-1} \frac{(-1)^k (\nu)_k e^{c z (2 k - 2 q - \nu)} z^{n-j}}{(2 c (q - k))^{j+1} k! \, (n-j)!}\right) /; n \in \mathbb{N} \land q \in \mathbb{N}^+$$

**Involving functions of the direct function and trigonometric functions**

## Involving powers of the direct function and trigonometric functions

### Involving sin

#### Involving $\sin(b z)$

01.24.21.0347.01

$$\int \sin(b\,z)\,\operatorname{sech}^{\nu}(c\,z)\,dz = -\frac{1}{2\left(b^2+c^2\,\nu^2\right)}\,e^{-i\,b\,z}\left(1+e^{2\,c\,z}\right)^{\nu}\operatorname{sech}^{\nu}(c\,z)\left(e^{2\,i\,b\,z}\,(b+i\,c\,\nu)\,{}_2F_1\!\left(\frac{i\,b}{2\,c}+\frac{\nu}{2},\,\nu;\,1+\frac{i\,b}{2\,c}+\frac{\nu}{2};\,-e^{2\,c\,z}\right)+(b-i\,c\,\nu)\,{}_2F_1\!\left(-\frac{i\,b}{2\,c}+\frac{\nu}{2},\,\nu;\,1-\frac{i\,b}{2\,c}+\frac{\nu}{2};\,-e^{2\,c\,z}\right)\right)$$

Involving powers of sin

## Involving $\sin^m(b\,z)$

01.24.21.0348.01

$$\int \sin^m(b\,z)\,\operatorname{sech}^{\nu}(c\,z)\,dz = 2^{-m}\left(1+e^{2\,c\,z}\right)^{\nu}\operatorname{sech}^{\nu}(c\,z)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(\frac{e^{i\,b\,(m-2\,k)\,z-\frac{i\,m\,\pi}{2}}}{b\,i\,(m-2\,k)+c\,\nu}\,{}_2F_1\!\left(-\frac{i\,b\,k}{c}+\frac{i\,b\,m}{2\,c}+\frac{\nu}{2},\,\nu;\,-\frac{i\,b\,k}{c}+\frac{i\,b\,m}{2\,c}+\frac{\nu}{2}+1;\,-e^{2\,c\,z}\right)+\frac{e^{\frac{i\,m\,\pi}{2}-i\,b\,(m-2\,k)\,z}}{c\,\nu-i\,b\,(m-2\,k)}\,{}_2F_1\!\left(\frac{i\,b\,k}{c}+\frac{\nu}{2}-\frac{i\,b\,m}{2\,c},\,\nu;\,\frac{i\,b\,k}{c}+\frac{\nu}{2}-\frac{i\,b\,m}{2\,c}+1;\,-e^{2\,c\,z}\right)\right)-\frac{2^{-m}\left(1+e^{2\,c\,z}\right)^{\nu}(m \bmod 2-1)\operatorname{sech}^{\nu}(c\,z)}{c\,\nu}\binom{m}{\frac{m}{2}}\,{}_2F_1\!\left(\frac{\nu}{2},\,\nu;\,\frac{\nu}{2}+1;\,-e^{2\,c\,z}\right)\;/;\;m\in\mathbb{N}^+$$

Involving cos

## Involving $\cos(b\,z)$

01.24.21.0349.01

$$\int \cos(b\,z)\,\operatorname{sech}^{\nu}(c\,z)\,dz = \frac{1}{2}\left(1+e^{2\,c\,z}\right)^{\nu}\operatorname{sech}^{\nu}(c\,z)\left(\frac{e^{i\,b\,z}}{i\,b+c\,\nu}\,{}_2F_1\!\left(\frac{i\,b}{2\,c}+\frac{\nu}{2},\,\nu;\,1+\frac{i\,b}{2\,c}+\frac{\nu}{2};\,-e^{2\,c\,z}\right)+\frac{e^{-i\,b\,z}}{-i\,b+c\,\nu}\,{}_2F_1\!\left(-\frac{i\,b}{2\,c}+\frac{\nu}{2},\,\nu;\,1-\frac{i\,b}{2\,c}+\frac{\nu}{2};\,-e^{2\,c\,z}\right)\right)$$

Involving powers of cos

## Involving $\cos^m(b\,z)$

01.24.21.0350.01

$$\int \cos^m(b z)\,\text{sech}^\nu(c z)\,dz = 2^{-m}\left(1+e^{2 c z}\right)^\nu \text{sech}^\nu(c z) \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \left(\frac{e^{-i b (m-2 s) z}}{c \nu - i b (m-2 s)}\, {}_2F_1\left(-\frac{i b m}{2 c}+\frac{i b s}{c}+\frac{\nu}{2}, \nu; -\frac{i b m}{2 c}+\frac{i b s}{c}+\frac{\nu}{2}+1; -e^{2 c z}\right) + \frac{e^{i b (m-2 s) z}}{b i (m-2 s)+c \nu}\, {}_2F_1\left(\frac{i b m}{2 c}+\frac{\nu}{2}-\frac{i b s}{c}, \nu; \frac{i b m}{2 c}+\frac{\nu}{2}-\frac{i b s}{c}+1; -e^{2 c z}\right)\right) - \frac{2^{-m}\left(1+e^{2 c z}\right)^\nu (m \bmod 2 - 1)\,\text{sech}^\nu(c z)}{c \nu} \binom{m}{\frac{m}{2}}\, {}_2F_1\left(\frac{\nu}{2}, \nu; \frac{\nu}{2}+1; -e^{2 c z}\right) \;/;\; m \in \mathbb{N}^+$$

**Involving functions of the direct function, trigonometric and a power functions**

## Involving powers of the direct function, trigonometric and a power functions

### Involving sin and power

### Involving $z^n \sin(a + b z)\,\text{sech}^\nu(c z)$

01.24.21.0351.01

$$\int z^n \sin(a+b z)\,\text{sech}^\nu(c z)\,dz = -\frac{i}{2}\left(1+e^{2 c z}\right)^\nu \text{sech}^\nu(c z)\, n! \left(e^{i a + i b z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i b + c \nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c \nu + i b}{2 c}, \ldots, \frac{c \nu + i b}{2 c}, \nu; \frac{c \nu + i b}{2 c}+1, \ldots, \frac{c \nu + i b}{2 c}+1; -e^{2 c z}\right) - e^{-i a - i b z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i b + c \nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c \nu - i b}{2 c}, \ldots, \frac{c \nu - i b}{2 c}, \nu; \frac{c \nu - i b}{2 c}+1, \ldots, \frac{c \nu - i b}{2 c}+1; -e^{2 c z}\right)\right) \;/;\; n \in \mathbb{N} \land b \neq -i c \nu \land b \neq i c \nu$$

01.24.21.0352.01

$$\int z^n \sin(b z)\,\text{sech}^\nu(c z)\,dz = -\frac{1}{2}\left(1+e^{2 c z}\right)^\nu n!\,\text{sech}^\nu(c z) \left(e^{-\frac{1}{2}(i \pi) - i b z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i b + c \nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c \nu - i b}{2 c}, \ldots, \frac{c \nu - i b}{2 c}, \nu; \frac{c \nu - i b}{2 c}+1, \ldots, \frac{c \nu - i b}{2 c}+1; -e^{2 c z}\right) + e^{\frac{i \pi}{2} + i b z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i b + c \nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c \nu + i b}{2 c}, \ldots, \frac{c \nu + i b}{2 c}, \nu; \frac{c \nu + i b}{2 c}+1, \ldots, \frac{c \nu + i b}{2 c}+1; -e^{2 c z}\right)\right) \;/;\; n \in \mathbb{N}$$

### Involving powers of sin and power

### Involving $z^n \sin^m(b z)\,\text{sech}^\nu(c z)$

01.24.21.0353.01

$$\int z^n \sin^m(b z) \operatorname{sech}^\nu(c z)\, dz = \left(1+e^{2 c z}\right)^\nu \binom{m}{\frac{m}{2}} 2^{-m}\, n!\, (1 - m \bmod 2) \operatorname{sech}^\nu(c z) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c \nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{\nu}{2}, \ldots, \frac{\nu}{2}, \nu; \frac{\nu}{2}+1, \ldots, \frac{\nu}{2}+1; -e^{2 c z}\right) + 2^{-m} \left(1+e^{2 c z}\right)^\nu n!\, \operatorname{sech}^\nu(c z) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left(e^{(i b (m-2k)) z - \frac{i \pi m}{2}} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i b (m-2k) + c \nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c \nu + i b (-2k+m)}{2c}, \ldots, \frac{c \nu + i b (-2k+m)}{2c}, \nu; \frac{c \nu + i b (-2k+m)}{2c}+1, \ldots, \frac{c \nu + i b (-2k+m)}{2c}+1; -e^{2 c z}\right) + e^{\frac{i \pi m}{2} + (-i b (m-2k)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i b (m-2k) + c \nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c \nu - i b (-2k+m)}{2c}, \ldots, \frac{c \nu - i b (-2k+m)}{2c}, \nu; \frac{c \nu - i b (-2k+m)}{2c}+1, \ldots, \frac{c \nu - i b (-2k+m)}{2c}+1; -e^{2 c z}\right)\right) /;\, n \in \mathbb{N} \land m \in \mathbb{N}^+$$

## Involving cos and power

### Involving $z^n \cos(a + b z) \operatorname{sech}^\nu(c z)$

01.24.21.0354.01

$$\int z^n \cos(a + b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{2} \left(1+e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z)\, n! \left(e^{i a + i b z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i b + c \nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c \nu + i b}{2c}, \ldots, \frac{c \nu + i b}{2c}, \nu; \frac{c \nu + i b}{2c}+1, \ldots, \frac{c \nu + i b}{2c}+1; -e^{2 c z}\right) + e^{-i a - i b z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i b + c \nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c \nu - i b}{2c}, \ldots, \frac{c \nu - i b}{2c}, \nu; \frac{c \nu - i b}{2c}+1, \ldots, \frac{c \nu - i b}{2c}+1; -e^{2 c z}\right)\right) /;\, n \in \mathbb{N} \land b \neq -i c \nu \land b \neq i c \nu$$

01.24.21.0355.01

$$\int z^n \cos(b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{2} \left(1+e^{2 c z}\right)^\nu n!\, \operatorname{sech}^\nu(c z) \left(e^{-i b z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i b + c \nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c \nu - i b}{2c}, \ldots, \frac{c \nu - i b}{2c}, \nu; \frac{c \nu - i b}{2c}+1, \ldots, \frac{c \nu - i b}{2c}+1; -e^{2 c z}\right) + e^{i b z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i b + c \nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c \nu + i b}{2c}, \ldots, \frac{c \nu + i b}{2c}, \nu; \frac{c \nu + i b}{2c}+1, \ldots, \frac{c \nu + i b}{2c}+1; -e^{2 c z}\right)\right) /;\, n \in \mathbb{N}$$

Involving powers of cos and power

## Involving $z^n \cos^m(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0356.01

$$\int z^n \cos^m(b z) \operatorname{sech}^\nu(c z) \, dz = \left(1 + e^{2 c z}\right)^\nu \binom{m}{\frac{m}{2}} 2^{-m} n! \,(1 - m \bmod 2) \operatorname{sech}^\nu(c z) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{\nu}{2}, \ldots, \frac{\nu}{2}, \nu; \frac{\nu}{2} + 1, \ldots, \frac{\nu}{2} + 1; -e^{2 c z}\right) + 2^{-m} \left(1 + e^{2 c z}\right)^\nu n! \operatorname{sech}^\nu(c z) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left(e^{(i b (m - 2 k)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i b (m - 2 k) + c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c \nu + i b (-2 k + m)}{2 c}, \ldots, \frac{c \nu + i b (-2 k + m)}{2 c}, \nu; \frac{c \nu + i b (-2 k + m)}{2 c} + 1, \ldots, \frac{c \nu + i b (-2 k + m)}{2 c} + 1; -e^{2 c z}\right) + e^{(-i b (m - 2 k)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i b (m - 2 k) + c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c \nu - i b (-2 k + m)}{2 c}, \ldots, \frac{c \nu - i b (-2 k + m)}{2 c}, \nu; \frac{c \nu - i b (-2 k + m)}{2 c} + 1, \ldots, \frac{c \nu - i b (-2 k + m)}{2 c} + 1; -e^{2 c z}\right)\right) /; n \in \mathbb{N} \land m \in \mathbb{N}^+$$

**Involving functions of the direct function, trigonometric and exponential functions**

## Involving powers of the direct function, trigonometric and exponential functions

Involving sin and exp

## Involving $e^{p z} \sin(a z) \operatorname{sech}^\nu(c z)$

01.24.21.0357.01

$$\int e^{p z} \sin(a z) \operatorname{sech}^\nu(c z) \, dz = \left(e^{(-i a + p) z} \left(1 + e^{2 c z}\right)^\nu \left(e^{2 i a z} \, i \,(a + i (p + c \nu)) \, {}_2F_1\left(\frac{i a}{2 c} + \frac{p}{2 c} + \frac{\nu}{2}, \nu; 1 + \frac{i a}{2 c} + \frac{p}{2 c} + \frac{\nu}{2}; -e^{2 c z}\right) + (i a + p + c \nu) \, {}_2F_1\left(-\frac{i a}{2 c} + \frac{p}{2 c} + \frac{\nu}{2}, \nu; 1 - \frac{i a}{2 c} + \frac{p}{2 c} + \frac{\nu}{2}; -e^{2 c z}\right)\right) \operatorname{sech}^\nu(c z)\right) \Big/ (2 (-i a + p + c \nu) (a - i (p + c \nu)))$$

01.24.21.0358.01

$$\int e^{(i a - c \nu) z} \sin(a z) \operatorname{sech}^\nu(c z) \, dz = \frac{1}{2} \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \left(e^{-c z \nu} \, i \, z - \frac{e^{z (2 i a - c \nu)} \, {}_2F_1\left(\frac{i a}{c}, \nu; 1 + \frac{i a}{c}; -e^{2 c z}\right)}{2 a} - \frac{i \, e^{c z (2 - \nu)} \, \nu \, {}_3F_2\left(1, 1, \nu + 1; 2, 2; -e^{2 c z}\right)}{2 c}\right)$$

01.24.21.0359.01

$$\int e^{-(i a+c\nu) z} \sin(a z) \operatorname{sech}^{\nu}(c z) \, dz = -\frac{1}{2} \left(1+e^{2 c z}\right)^{\nu} \operatorname{sech}^{\nu}(c z) \left(e^{-c z \nu} i z + \frac{e^{-z (2 i a+c \nu)} \, {}_2F_1\left(-\frac{i a}{c}, \nu; 1-\frac{i a}{c}; -e^{2 c z}\right)}{2 a} - \frac{i e^{c z (2-\nu)} \nu \, {}_3F_2\left(1, 1, \nu+1; 2, 2; -e^{2 c z}\right)}{2 c}\right)$$

## Involving powers of sin and exp

### Involving $e^{p z} \sin^m(a z) \operatorname{sech}^{\nu}(c z)$

01.24.21.0360.01

$$\int e^{p z} \sin^m(a z) \operatorname{sech}^{\nu}(c z) \, dz = 2^{-m} \left(1+e^{2 c z}\right)^{\nu} \operatorname{sech}^{\nu}(c z) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left(\frac{1}{a i (m-2k)+p+c\nu} \left(e^{(a i (m-2k)+p) z - \frac{i m \pi}{2}} \, {}_2F_1\left(-\frac{i a k}{c} + \frac{i a m}{2 c} + \frac{p}{2 c} + \frac{\nu}{2}, \nu; -\frac{i a k}{c} + \frac{i a m}{2 c} + \frac{p}{2 c} + \frac{\nu}{2} + 1; -e^{2 c z}\right)\right) + \left(e^{\frac{i \pi m}{2} + (p - i a (m-2k)) z} \, {}_2F_1\left(\frac{i a k}{c} + \frac{p}{2 c} + \frac{\nu}{2} - \frac{i a m}{2 c}, \nu; \frac{i a k}{c} + \frac{p}{2 c} + \frac{\nu}{2} - \frac{i a m}{2 c} + 1; -e^{2 c z}\right)\right) \Big/ \left(-i a (m-2k)+p+c\nu\right)\right) - \frac{2^{-m} e^{p z} \left(1+e^{2 c z}\right)^{\nu} (m \bmod 2 - 1) \operatorname{sech}^{\nu}(c z)}{p+c\nu} \binom{m}{\frac{m}{2}} {}_2F_1\left(\frac{p}{2 c} + \frac{\nu}{2}, \nu; \frac{p}{2 c} + \frac{\nu}{2} + 1; -e^{2 c z}\right) /; m \in \mathbb{N}^+$$

## Involving cos and exp

### Involving $e^{p z} \cos(a z) \operatorname{sech}^{\nu}(c z)$

01.24.21.0361.01

$$\int e^{p z} \cos(a z) \operatorname{sech}^{\nu}(c z) \, dz = \frac{1}{2} \left(1+e^{2 c z}\right)^{\nu} \operatorname{sech}^{\nu}(c z) \left(\frac{e^{(i a+p) z}}{i a+p+c\nu} \, {}_2F_1\left(\frac{i a}{2 c} + \frac{p}{2 c} + \frac{\nu}{2}, \nu; 1 + \frac{i a}{2 c} + \frac{p}{2 c} + \frac{\nu}{2}; -e^{2 c z}\right) + \frac{e^{(-i a+p) z}}{-i a+p+c\nu} \, {}_2F_1\left(-\frac{i a}{2 c} + \frac{p}{2 c} + \frac{\nu}{2}, \nu; 1 - \frac{i a}{2 c} + \frac{p}{2 c} + \frac{\nu}{2}; -e^{2 c z}\right)\right)$$

01.24.21.0362.01

$$\int e^{(i a - c\nu) z} \cos(a z) \operatorname{sech}^{\nu}(c z) \, dz = \frac{1}{2} \left(1+e^{2 c z}\right)^{\nu} \operatorname{sech}^{\nu}(c z) \left(e^{-c z \nu} z - \frac{i e^{z (2 i a - c\nu)} \, {}_2F_1\left(\frac{i a}{c}, \nu; 1+\frac{i a}{c}; -e^{2 c z}\right)}{2 a} - \frac{e^{c z (2-\nu)} \nu \, {}_3F_2\left(1, 1, \nu+1; 2, 2; -e^{2 c z}\right)}{2 c}\right)$$

01.24.21.0363.01

$$\int e^{-(i a+c\nu)z}\cos(a z)\operatorname{sech}^{\nu}(c z)\,dz = \frac{1}{2}\left(1+e^{2cz}\right)^{\nu}\operatorname{sech}^{\nu}(c z)\left(e^{-cz\nu}z+\frac{i\,e^{-z(2ia+c\nu)}\,{}_2F_1\left(-\frac{ia}{c},\nu;1-\frac{ia}{c};-e^{2cz}\right)}{2a}-\frac{e^{cz(2-\nu)}\,\nu\,{}_3F_2\left(1,1,\nu+1;2,2;-e^{2cz}\right)}{2c}\right)$$

Involving powers of cos and exp

## Involving $e^{pz}\cos^m(a z)\operatorname{sech}^{\nu}(c z)$

01.24.21.0364.01

$$\int e^{pz}\cos^m(a z)\operatorname{sech}^{\nu}(c z)\,dz = 2^{-m}\left(1+e^{2cz}\right)^{\nu}\operatorname{sech}^{\nu}(c z)\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(\frac{e^{(p+a i(m-2s))z}\,{}_2F_1\left(\frac{p}{2c}+\frac{iam}{2c}+\frac{\nu}{2}-\frac{ias}{c},\nu;\frac{p}{2c}+\frac{iam}{2c}+\frac{\nu}{2}-\frac{ias}{c}+1;-e^{2cz}\right)}{p+a i(m-2s)+c\nu}+\frac{e^{(p-ia(m-2s))z}\,{}_2F_1\left(\frac{p}{2c}+\frac{ias}{c}+\frac{\nu}{2}-\frac{iam}{2c},\nu;\frac{p}{2c}+\frac{ias}{c}+\frac{\nu}{2}-\frac{iam}{2c}+1;-e^{2cz}\right)}{p-ia(m-2s)+c\nu}\right)-\frac{2^{-m}e^{pz}\left(1+e^{2cz}\right)^{\nu}(m\bmod 2-1)\operatorname{sech}^{\nu}(c z)}{p+c\nu}\binom{m}{\frac{m}{2}}{}_2F_1\left(\frac{p}{2c}+\frac{\nu}{2},\nu;\frac{p}{2c}+\frac{\nu}{2}+1;-e^{2cz}\right)\ /;\ m\in\mathbb{N}^+$$

**Involving functions of the direct function, trigonometric, exponential and a power functions**

## Involving powers of the direct function, trigonometric, exponential and a power functions

Involving sin, exp and power

## Involving $z^n e^{pz}\sin(a+b\,z)\operatorname{sech}^{\nu}(c\,z)$

01.24.21.0365.01

$$\int z^n e^{pz}\sin(a+bz)\operatorname{sech}^{\nu}(c z)\,dz = -\frac{i}{2}\left(1+e^{2cz}\right)^{\nu}\operatorname{sech}^{\nu}(c z)\,n!\left(e^{ia+(p+ib)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(ib+p+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{c\nu+p+ib}{2c},\ldots,\frac{c\nu+p+ib}{2c},\nu;\frac{c\nu+p+ib}{2c}+1,\ldots,\frac{c\nu+p+ib}{2c}+1;-e^{2cz}\right)-e^{-ia+(p-ib)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(-ib+p+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{c\nu+p-ib}{2c},\ldots,\frac{c\nu+p-ib}{2c},\nu;\frac{c\nu+p-ib}{2c}+1,\ldots,\frac{c\nu+p-ib}{2c}+1;-e^{2cz}\right)\right)\ /;\ n\in\mathbb{N}\land p+ib\neq -c\nu\land p-ib\neq -c\nu$$

01.24.21.0366.01

$$\int z^n e^{p z} \sin(b z) \operatorname{sech}^\nu(c z) \, dz = \frac{1}{2} \left(1 + e^{2 c z}\right)^\nu n! \operatorname{sech}^\nu(c z) \left( e^{-\frac{1}{2}(i \pi) + (i b + p) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (i b + p + c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c \nu + p + i b}{2 c}, \ldots, \frac{c \nu + p + i b}{2 c}, \nu; \frac{c \nu + p + i b}{2 c} + 1, \ldots, \frac{c \nu + p + i b}{2 c} + 1; -e^{2 c z}\right) + e^{\frac{i \pi}{2} + (-i b + p) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (-i b + p + c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c \nu + p - i b}{2 c}, \ldots, \frac{c \nu + p - i b}{2 c}, \nu; \frac{c \nu + p - i b}{2 c} + 1, \ldots, \frac{c \nu + p - i b}{2 c} + 1; -e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

01.24.21.0367.01

$$\int z^n e^{(i b - c \nu) z} \sin(b z) \operatorname{sech}^\nu(c z) \, dz = \frac{i}{2} \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \left( \frac{e^{-c \nu z} z^{n+1}}{n+1} - e^{c (2-\nu) z} \nu \, n! \sum_{j=0}^n \frac{(-1)^j z^{n-j} (2 c)^{-j-1}}{(n-j)!} {}_{j+3}F_{j+2}\left(1, \ldots, 1, \nu + 1; 2, \ldots, 2; -e^{2 c z}\right) - e^{(2 i b - c \nu) z} n! \sum_{j=0}^n \frac{(-1)^j z^{n-j} (2 i b)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i b}{c}, \ldots, \frac{i b}{c}, \nu; \frac{i b}{c} + 1, \ldots, \frac{i b}{c} + 1; -e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

01.24.21.0368.01

$$\int z^n e^{-(i b + c \nu) z} \sin(b z) \operatorname{sech}^\nu(c z) \, dz = -\frac{i}{2} \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \left( \frac{e^{-c \nu z} z^{n+1}}{n+1} - e^{c (2-\nu) z} \nu \, n! \sum_{j=0}^n \frac{(-1)^j z^{n-j} (2 c)^{-j-1}}{(n-j)!} {}_{j+3}F_{j+2}\left(1, \ldots, 1, \nu + 1; 2, \ldots, 2; -e^{2 c z}\right) + e^{-(2 i b + c \nu) z} n! \sum_{j=0}^n \frac{z^{n-j} (2 i b)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(-\frac{i b}{c}, \ldots, -\frac{i b}{c}, \nu; -\frac{i b}{c} + 1, \ldots, -\frac{i b}{c} + 1; -e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

## Involving powers of sin, exp and power

### Involving $z^n e^{p z} \sin^m(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0369.01

$$\int z^n e^{pz} \sin^m(bz)\operatorname{sech}^\nu(cz)\,dz = 2^{-m} e^{pz}\left(1+e^{2cz}\right)^\nu \binom{m}{\frac{m}{2}} n!\,(1-m \bmod 2)\operatorname{sech}^\nu(cz) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu+p}{2c},\ldots,\frac{c\nu+p}{2c},\nu;\frac{c\nu+p}{2c}+1,\ldots,\frac{c\nu+p}{2c}+1;-e^{2cz}\right) + 2^{-m}\left(1+e^{2cz}\right)^\nu n!\operatorname{sech}^\nu(cz)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(e^{(p+bi(m-2k))z-\frac{i\pi m}{2}} \sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p+bi(m-2k)+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu+p+ib(-2k+m)}{2c},\ldots,\frac{c\nu+p+ib(-2k+m)}{2c},\nu;\frac{c\nu+p+ib(-2k+m)}{2c}+1,\ldots,\frac{c\nu+p+ib(-2k+m)}{2c}+1;-e^{2cz}\right) + e^{\frac{i\pi m}{2}+(p-ib(m-2k))z} \sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p-ib(m-2k)+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu+p-ib(-2k+m)}{2c},\ldots,\frac{c\nu+p-ib(-2k+m)}{2c},\nu;\frac{c\nu+p-ib(-2k+m)}{2c}+1,\ldots,\frac{c\nu+p-ib(-2k+m)}{2c}+1;-e^{2cz}\right)\right) /;\ n\in\mathbb{N}\wedge m\in\mathbb{N}^+$$

## Involving cos, exp and power

### Involving $z^n e^{pz}\cos(a+bz)\operatorname{sech}^\nu(cz)$

01.24.21.0370.01

$$\int z^n e^{pz}\cos(a+bz)\operatorname{sech}^\nu(cz)\,dz = \frac{1}{2}\left(1+e^{2cz}\right)^\nu \operatorname{sech}^\nu(cz)\,n!\left(e^{ia+(p+ib)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(ib+p+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu+p+ib}{2c},\ldots,\frac{c\nu+p+ib}{2c},\nu;\frac{c\nu+p+ib}{2c}+1,\ldots,\frac{c\nu+p+ib}{2c}+1;-e^{2cz}\right) + e^{-ia+(p-ib)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(-ib+p+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu+p-ib}{2c},\ldots,\frac{c\nu+p-ib}{2c},\nu;\frac{c\nu+p-ib}{2c}+1,\ldots,\frac{c\nu+p-ib}{2c}+1;-e^{2cz}\right)\right) /;\ n\in\mathbb{N}\wedge p+ib\neq -c\nu\wedge p-ib\neq -c\nu$$

01.24.21.0371.01

$$\int z^n e^{p z} \cos(b z) \operatorname{sech}^\nu(c z) \, dz = \frac{1}{2} \left(1 + e^{2 c z}\right)^\nu n! \operatorname{sech}^\nu(c z) \left( e^{(-i b + p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i b + p + c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{c \nu + p - i b}{2 c}, \ldots, \frac{c \nu + p - i b}{2 c}, \nu; \frac{c \nu + p - i b}{2 c} + 1, \ldots, \frac{c \nu + p - i b}{2 c} + 1; -e^{2 c z} \right) + e^{(i b + p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i b + p + c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{c \nu + p + i b}{2 c}, \ldots, \frac{c \nu + p + i b}{2 c}, \nu; \frac{c \nu + p + i b}{2 c} + 1, \ldots, \frac{c \nu + p + i b}{2 c} + 1; -e^{2 c z} \right) \right) /; n \in \mathbb{N}$$

01.24.21.0372.01

$$\int z^n e^{(i b - c \nu) z} \cos(b z) \operatorname{sech}^\nu(c z) \, dz = \frac{1}{2} \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \left( \frac{e^{-c \nu z} z^{n+1}}{n+1} - e^{c (2 - \nu) z} \nu \, n! \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (2 c)^{-j-1}}{(n-j)!} \, {}_{j+3}F_{j+2}\left(1, \ldots, 1, \nu + 1; 2, \ldots, 2; -e^{2 c z}\right) + e^{(2 i b - c \nu) z} n! \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (2 i b)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{i b}{c}, \ldots, \frac{i b}{c}, \nu; \frac{i b}{c} + 1, \ldots, \frac{i b}{c} + 1; -e^{2 c z} \right) \right) /; n \in \mathbb{N}$$

01.24.21.0373.01

$$\int z^n e^{-(i b + c \nu) z} \cos(b z) \operatorname{sech}^\nu(c z) \, dz = \frac{1}{2} \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \left( \frac{e^{-c \nu z} z^{n+1}}{n+1} - n! \, \nu \, e^{c (2 - \nu) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (2 c)^{-j-1}\right)}{(n-j)!} \, {}_{j+3}F_{j+2}\left(1, \ldots, 1, \nu + 1; 2, \ldots, 2; -e^{2 c z}\right) - n! \, e^{-(2 i b + c \nu) z} \sum_{j=0}^{n} \frac{\left(z^{n-j} (2 i b)^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left( -\frac{i b}{c}, \ldots, -\frac{i b}{c}, \nu; 1 - \frac{i b}{c}, \ldots, 1 - \frac{i b}{c}; -e^{2 c z} \right) \right) /; n \in \mathbb{N}$$

## Involving powers of cos, exp and power

### Involving $z^n e^{p z} \cos^m(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0374.01

$$\int z^n e^{p z} \cos^m(b z) \operatorname{sech}^\nu(c z)\, dz = e^{p z} \left(1 + e^{2 c z}\right)^\nu \binom{m}{\frac{m}{2}} 2^{-m} n!\, (1 - m \bmod 2) \operatorname{sech}^\nu(c z) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p + c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c \nu + p}{2 c}, \ldots, \frac{c \nu + p}{2 c}, \nu; \frac{c \nu + p}{2 c} + 1, \ldots, \frac{c \nu + p}{2 c} + 1; -e^{2 c z}\right) + 2^{-m} \left(1 + e^{2 c z}\right)^\nu n! \operatorname{sech}^\nu(c z) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left(e^{(p + i b (m - 2 k)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p + i b (m - 2 k) + c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c \nu + p + i b (-2 k + m)}{2 c}, \ldots, \frac{c \nu + p + i b (-2 k + m)}{2 c}, \nu; \frac{c \nu + p + i b (-2 k + m)}{2 c} + 1, \ldots, \frac{c \nu + p + i b (-2 k + m)}{2 c} + 1; -e^{2 c z}\right) + e^{(p - i b (m - 2 k)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p - i b (m - 2 k) + c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c \nu + p - i b (-2 k + m)}{2 c}, \ldots, \frac{c \nu + p - i b (-2 k + m)}{2 c}, \nu; \frac{c \nu + p - i b (-2 k + m)}{2 c} + 1, \ldots, \frac{c \nu + p - i b (-2 k + m)}{2 c} + 1; -e^{2 c z}\right)\right) /; n \in \mathbb{N} \land m \in \mathbb{N}^+$$

**Involving functions of the direct function and hyperbolic functions**

## Involving powers of the direct function and hyperbolic functions

### Involving sinh

### Involving sinh($b z$)

01.24.21.0375.01

$$\int \sinh(b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{2 (b - c \nu) (b + c \nu)} \left(e^{-b z} \left(1 + e^{2 c z}\right)^\nu \left(e^{2 b z} (b - c \nu)\, {}_2F_1\left(\frac{b + c \nu}{2 c}, \nu; \frac{b + c \nu}{2 c} + 1; -e^{2 c z}\right) + (b + c \nu)\, {}_2F_1\left(-\frac{b - c \nu}{2 c}, \nu; \frac{1}{2}\left(-\frac{b}{c} + \nu + 2\right); -e^{2 c z}\right)\right) \operatorname{sech}^\nu(c z)\right)$$

01.24.21.0376.01

$$\int \sinh(c \nu z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{2} \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \left(-e^{-c \nu z} z + \frac{e^{c \nu z}\, {}_2F_1\left(\nu, \nu; \nu + 1; -e^{2 c z}\right)}{2 c \nu} + \frac{e^{-c (\nu - 2) z}\, \nu\, {}_3F_2\left(1, 1, \nu + 1; 2, 2; -e^{2 c z}\right)}{2 c}\right)$$

01.24.21.0377.01

$$\int \sinh(c z) \operatorname{sech}^\nu(c z)\, dz = -\frac{\operatorname{sech}^{\nu - 1}(c z)}{c (\nu - 1)}$$

01.24.21.0378.01

$$\int \sinh(c z) \operatorname{sech}^2(c z)\, dz = -\frac{\operatorname{sech}(c z)}{c}$$

## Involving sinh and algebraic functions of sech

01.24.21.0379.01

$$\int \sinh(z)\,\text{sech}^{n+1}(z)\left((b\,\text{sech}^n(z)+a)^{\frac{1}{c}}\right)^r dz = -\frac{c\,(b\,\text{sech}^n(z)+a)\left((b\,\text{sech}^n(z)+a)^{\frac{1}{c}}\right)^r}{b\,n\,(c+r)}$$

## Involving power of sinh

### Involving $\sinh^u(b\,z)\,\text{sech}^\nu(c\,z)$

01.24.21.0380.01

$$\int \sinh^u(b\,z)\,\text{sech}^\nu(c\,z)\,dz = i^u\,2^{-u}\left(1+e^{2cz}\right)^\nu \text{sech}^\nu(c\,z)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\left(\frac{e^{(b(u-2k))z-\frac{i\pi u}{2}}}{b\,(u-2k)+c\,\nu}\,{}_2F_1\!\left(-\frac{b\,k}{c}+\frac{b\,u}{2\,c}+\frac{\nu}{2},\,\nu;\,-\frac{b\,k}{c}+\frac{b\,u}{2\,c}+\frac{\nu}{2}+1;\,-e^{2cz}\right)+\frac{e^{\frac{i\pi u}{2}-(b(u-2k))z}}{c\,\nu-b\,(u-2k)}\,{}_2F_1\!\left(\frac{b\,k}{c}+\frac{\nu}{2}-\frac{b\,u}{2\,c},\,\nu;\,\frac{b\,k}{c}+\frac{\nu}{2}-\frac{b\,u}{2\,c}+1;\,-e^{2cz}\right)\right)-\frac{\left(1+e^{2cz}\right)^\nu\,(u \bmod 2-1)\,\text{sech}^\nu(c\,z)}{c\,\nu}\left(\frac{i}{2}\right)^u\binom{u}{\frac{u}{2}}\,{}_2F_1\!\left(\frac{\nu}{2},\,\nu;\,\frac{\nu}{2}+1;\,-e^{2cz}\right)\,/;\,u\in\mathbb{N}^+$$

01.24.21.0381.01

$$\int \sinh^\mu(c\,z)\,\text{sech}^\nu(c\,z)\,dz = -\frac{\text{sech}^{\nu-1}(c\,z)\sinh^{\mu+1}(c\,z)\left(-\sinh^2(c\,z)\right)^{\frac{1}{2}(-\mu-1)}}{c\,(1-\nu)}\,{}_2F_1\!\left(\frac{1-\nu}{2},\,\frac{1-\mu}{2};\,\frac{3-\nu}{2};\,\cosh^2(c\,z)\right)$$

01.24.21.0382.01

$$\int \sinh^{\frac{1}{2}}(2\,c\,z)\,\text{sech}^3(c\,z)\,dz = \frac{2\,\text{sech}(c\,z)\sinh^{\frac{1}{2}}(2\,c\,z)\tanh(c\,z)}{3\,c}$$

01.24.21.0383.01

$$\int \frac{\text{sech}^3(c\,z)}{\sinh^{\frac{1}{2}}(2\,c\,z)}\,dz = \frac{\text{sech}(c\,z)\left(\text{sech}^2(c\,z)+4\right)\sinh^{\frac{1}{2}}(2\,c\,z)}{5\,c}$$

## Involving algebraic functions of sinh

01.24.21.0384.01

$$\int \sqrt{a+b\sinh(c\,z)}\;\operatorname{sech}^2(c\,z)\,dz = \frac{1}{c\sqrt{a+b\sinh(c\,z)}}\left(-i\,(a-i\,b)\sqrt{\frac{a+b\sinh(c\,z)}{a-i\,b}}\;E\!\left(\frac{1}{4}(\pi-2\,i\,c\,z)\,\middle|\,-\frac{2\,i\,b}{a-i\,b}\right)+(a+b\sinh(c\,z))\tanh(c\,z)+ i\,a\,F\!\left(\frac{1}{4}(\pi-2\,i\,c\,z)\,\middle|\,-\frac{2\,i\,b}{a-i\,b}\right)\sqrt{\frac{a+b\sinh(c\,z)}{a-i\,b}}\right)$$

## Involving cosh

### Involving cosh$(b\,z)$

01.24.21.0385.01

$$\int \cosh(b\,z)\operatorname{sech}^\nu(c\,z)\,dz = \frac{1}{2\,(b-c\,\nu)\,(b+c\,\nu)}\left(e^{-b\,z}\left(1+e^{2\,c\,z}\right)^\nu \left(e^{2\,b\,z}\,(b-c\,\nu)\,{}_2F_1\!\left(\frac{b+c\,\nu}{2\,c},\,\nu;\,\frac{b+c\,\nu}{2\,c}+1;\,-e^{2\,c\,z}\right)-(b+c\,\nu)\,{}_2F_1\!\left(-\frac{b-c\,\nu}{2\,c},\,\nu;\,\frac{1}{2}\left(-\frac{b}{c}+\nu+2\right);\,-e^{2\,c\,z}\right)\right)\operatorname{sech}^\nu(c\,z)\right)$$

01.24.21.0386.01

$$\int \cosh(c\,\nu\,z)\operatorname{sech}^\nu(c\,z)\,dz = \frac{1}{2}\left(1+e^{2\,c\,z}\right)^\nu \operatorname{sech}^\nu(c\,z)\left(e^{-c\,\nu\,z}\,z+\frac{e^{c\,\nu\,z}\,{}_2F_1\!\left(\nu,\,\nu;\,\nu+1;\,-e^{2\,c\,z}\right)}{2\,c\,\nu}-\frac{e^{-c\,(\nu-2)\,z}\,\nu\,{}_3F_2\!\left(1,\,1,\,\nu+1;\,2,\,2;\,-e^{2\,c\,z}\right)}{2\,c}\right)$$

01.24.21.0387.01

$$\int \cosh(c\,z)\operatorname{sech}^\nu(c\,z)\,dz = \frac{\operatorname{sech}^{\nu-2}(c\,z)\sinh(c\,z)}{c\,(\nu-2)\sqrt{-\sinh^2(c\,z)}}\,{}_2F_1\!\left(1-\frac{\nu}{2},\,\frac{1}{2};\,2-\frac{\nu}{2};\,\cosh^2(c\,z)\right)$$

01.24.21.0388.01

$$\int \cosh(2\,z)\operatorname{sech}^3(z)\,dz = 3\tan^{-1}\!\left(\tanh\!\left(\frac{z}{2}\right)\right)-\frac{1}{2}\operatorname{sech}(z)\tanh(z)$$

01.24.21.0389.01

$$\int \cosh(4\,z)\operatorname{sech}^5(z)\,dz = \frac{1}{8}\left(2\tanh(z)\operatorname{sech}^3(z)-29\tanh(z)\operatorname{sech}(z)+70\tan^{-1}\!\left(\tanh\!\left(\frac{z}{2}\right)\right)\right)$$

01.24.21.0390.01

$$\int \cosh(5\,z)\operatorname{sech}^5(z)\,dz = \frac{1}{3}\left(48\,z+5\left(\operatorname{sech}^2(z)-10\right)\tanh(z)\right)$$

## Involving power of cosh

### Involving $\cosh^u(b\,z)\operatorname{sech}^\nu(c\,z)$

01.24.21.0391.01

$$\int \cosh^u(b z)\,\text{sech}^\nu(c z)\,dz = 2^{-u}\left(1+e^{2cz}\right)^\nu \text{sech}^\nu(c z) \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left( \frac{e^{(b(u-2s))z}\,{}_2F_1\left(-\frac{bs}{c}+\frac{bu}{2c}+\frac{\nu}{2},\,\nu;\,-\frac{bs}{c}+\frac{bu}{2c}+\frac{\nu}{2}+1;\,-e^{2cz}\right)}{b(u-2s)+c\nu} + \frac{e^{(-b(u-2s))z}\,{}_2F_1\left(\frac{bs}{c}+\frac{\nu}{2}-\frac{bu}{2c},\,\nu;\,\frac{bs}{c}+\frac{\nu}{2}-\frac{bu}{2c}+1;\,-e^{2cz}\right)}{c\nu-b(u-2s)} \right) - \frac{2^{-u}\left(1+e^{2cz}\right)^\nu \binom{u}{\frac{u}{2}}\,{}_2F_1\left(\frac{\nu}{2},\,\nu;\,\frac{\nu}{2}+1;\,-e^{2cz}\right)(u \bmod 2-1)\,\text{sech}^\nu(c z)}{c\nu} \;/;\; u \in \mathbb{N}^+$$

01.24.21.0392.01

$$\int \cosh^\mu(c z)\,\text{sech}^\nu(c z)\,dz = -\frac{\cosh^{\mu+1}(c z)\,\text{sech}^\nu(c z)\sinh(c z)}{c(\mu-\nu+1)\sqrt{-\sinh^2(c z)}}\,{}_2F_1\left(\frac{1}{2}(\mu-\nu+1),\,\frac{1}{2};\,\frac{1}{2}(\mu-\nu+3);\,\cosh^2(c z)\right)$$

01.24.21.0393.01

$$\int \sqrt{\cosh^3(2z)}\,\text{sech}^3(z)\,dz = -\frac{1}{2\cosh^{\frac{3}{2}}(2z)}\left(\sqrt{\cosh^3(2z)}\left(-4\sqrt{2}\,\sinh^{-1}\left(\sqrt{2}\,\sinh(z)\right)+5\tanh^{-1}\left(\frac{\sinh(z)}{\cosh^{\frac{1}{2}}(2z)}\right)+\cosh^{\frac{1}{2}}(2z)\,\text{sech}(z)\tanh(z)\right)\right)$$

## Involving algebraic functions of cosh

01.24.21.0394.01

$$\int \sqrt{a+b\cosh(2cz)}\,\text{sech}^2(c z)\,dz = \frac{1}{c\sqrt{a+b\cosh(2cz)}}\left(\sqrt{\frac{a+b\cosh(2cz)}{a+b}}\,(a+b)\,i\,E\left(i\,c\,z \,\middle|\, \frac{2b}{a+b}\right) - i(a+b)\sqrt{\frac{a+b\cosh(2cz)}{a+b}}\,F\left(i\,c\,z \,\middle|\, \frac{2b}{a+b}\right) + (a+b\cosh(2cz))\tanh(c z)\right)$$

01.24.21.0395.01

$$\int \sqrt{a-a\cosh(2cz)}\,\text{sech}^2(c z)\,dz = -\frac{\sqrt{a-a\cosh(2cz)}\,\text{csch}(c z)\,\text{sech}(c z)}{c}$$

01.24.21.0396.01

$$\int \sqrt{\cosh(2cz)\,a+a}\,\text{sech}^2(c z)\,dz = \frac{2\tan^{-1}\left(\tanh\left(\frac{cz}{2}\right)\right)\sqrt{\cosh(2cz)\,a+a}\,\text{sech}(c z)}{c}$$

01.24.21.0397.01

$$\int \sqrt{a+b\cosh(2cz)}\,\text{sech}^3(c z)\,dz = \frac{1}{2c}\left(\frac{a+b}{\sqrt{a-b}}\tan^{-1}\left(\frac{\sqrt{a-b}\,\sinh(c z)}{\sqrt{a+b\cosh(2cz)}}\right)+\sqrt{a+b\cosh(2cz)}\,\text{sech}(c z)\tanh(c z)\right)$$

01.24.21.0398.01

$$\int \sqrt{a+b\cosh(2cz)}\,\operatorname{sech}^4(cz)\,dz = \left( \left(2\left(a^2+2ba-b^2\right)\cosh(2cz)+a\,(4a-b+b\cosh(4cz))\right)\tanh(cz)\,\operatorname{sech}^2(cz)+4\,i\,a\,(a+b)\sqrt{\frac{a+b\cosh(2cz)}{a+b}}\; E\!\left(i\,c\,z \,\middle|\, \frac{2b}{a+b}\right) - 4\,i\left(a^2-b^2\right)\sqrt{\frac{a+b\cosh(2cz)}{a+b}}\; F\!\left(i\,c\,z \,\middle|\, \frac{2b}{a+b}\right)\right) \Big/ \left(6\,(a-b)\,c\sqrt{a+b\cosh(2cz)}\right)$$

01.24.21.0399.01

$$\int \cosh(2cz)\sqrt{\cosh(2cz)\,a+a}\,\operatorname{sech}^2(cz)\,dz = \frac{2\sqrt{\cosh(2cz)\,a+a}\,\operatorname{sech}(cz)\left(\sinh(cz)-\tan^{-1}\!\left(\tanh\!\left(\frac{cz}{2}\right)\right)\right)}{c}$$

01.24.21.0400.01

$$\int \frac{\operatorname{sech}^2(cz)}{\sqrt{a+b\cosh(2cz)}}\,dz = \left( i\,(a+b)\sqrt{\frac{a+b\cosh(2cz)}{a+b}}\; E\!\left(i\,c\,z \,\middle|\, \frac{2b}{a+b}\right) - i\,(a-b)\sqrt{\frac{a+b\cosh(2cz)}{a+b}}\; F\!\left(i\,c\,z \,\middle|\, \frac{2b}{a+b}\right) + (a+b\cosh(2cz))\tanh(cz)\right) \Big/ \left((a-b)\,c\sqrt{a+b\cosh(2cz)}\right)$$

01.24.21.0401.01

$$\int \frac{\operatorname{sech}^3(cz)}{\sqrt{a+b\cosh(2cz)}}\,dz = \frac{(a-3b)\tan^{-1}\!\left(\frac{\sqrt{a-b}\,\sinh(cz)}{\sqrt{a+b\cosh(2cz)}}\right)+\sqrt{a-b}\,\sqrt{a+b\cosh(2cz)}\,\operatorname{sech}(cz)\tanh(cz)}{2\,(a-b)^{3/2}\,c}$$

01.24.21.0402.01

$$\int \frac{\operatorname{sech}^4(cz)}{\sqrt{a+b\cosh(2cz)}}\,dz = \left( \frac{1}{2}\left(4a^2-7ba-3b^2+2\left(a^2-ba-4b^2\right)\cosh(2cz)+(a-3b)\,b\cosh(4cz)\right)\tanh(cz)\,\operatorname{sech}^2(cz) + 2\,i\left(a^2-2ba-3b^2\right)\sqrt{\frac{a+b\cosh(2cz)}{a+b}}\; E\!\left(i\,c\,z \,\middle|\, \frac{2b}{a+b}\right) - 2\,i\left(a^2-3ba+2b^2\right)\sqrt{\frac{a+b\cosh(2cz)}{a+b}}\; F\!\left(i\,c\,z \,\middle|\, \frac{2b}{a+b}\right)\right) \Big/ \left(3\,(a-b)^2\,c\sqrt{a+b\cosh(2cz)}\right)$$

01.24.21.0403.01

$$\int \sqrt{\cosh(cz)\,a+a}\,\operatorname{sech}^2\!\left(\frac{cz}{2}\right)\operatorname{sech}(cz)\,dz = \frac{2\left(\sqrt{2}\,\tan^{-1}\!\left(\sqrt{2}\,\sinh\!\left(\frac{cz}{2}\right)\right)-2\tan^{-1}\!\left(\tanh\!\left(\frac{cz}{4}\right)\right)\right)\sqrt{a\,(\cosh(cz)+1)}\,\operatorname{sech}\!\left(\frac{cz}{2}\right)}{c}$$

## Involving tanh

## Involving $\tanh(c\,z)\,\operatorname{sech}^{\nu}(c\,z)$

01.24.21.0404.01

$$\int \tanh(c\,z)\,\operatorname{sech}^{\nu}(c\,z)\,dz = \frac{e^{c\,z}\left(1+e^{2\,c\,z}\right)^{\nu}\operatorname{sech}^{\nu}(c\,z)}{c}\left(\frac{e^{c\,z}\,{}_2F_1\!\left(\frac{\nu}{2}+1,\,\nu+1;\,\frac{\nu}{2}+2;\,-e^{2\,c\,z}\right)}{\nu+2}-\frac{e^{-c\,z}\,{}_2F_1\!\left(\frac{\nu}{2},\,\nu+1;\,\frac{\nu}{2}+1;\,-e^{2\,c\,z}\right)}{\nu}\right)$$

01.24.21.0405.01

$$\int \tanh(z)\,\operatorname{sech}^2(z)\,dz = -\frac{1}{2}\operatorname{sech}^2(z)$$

01.24.21.0406.01

$$\int \tanh(z)\,\operatorname{sech}^3(z)\,dz = -\frac{1}{3}\operatorname{sech}^3(z)$$

01.24.21.0407.01

$$\int \tanh(c\,z)\left(\operatorname{sech}^{\frac{1}{a}}(c\,z)\right)^{b} dz = -\frac{a\left(\operatorname{sech}^{\frac{1}{a}}(c\,z)\right)^{b}}{b\,c}$$

### Involving power of tanh

## Involving $\tanh^{u}(c\,z)\,\operatorname{sech}^{\nu}(c\,z)$

01.24.21.0408.01

$$\int \tanh^{\mu}(c\,z)\,\operatorname{sech}^{\nu}(c\,z)\,dz = \frac{\operatorname{sech}^{\nu-1}(c\,z)\sinh(c\,z)\left(-\sinh^2(c\,z)\right)^{\frac{1}{2}(-\mu-1)}\tanh^{\mu}(c\,z)}{c\,(\mu+\nu-1)}\,{}_2F_1\!\left(\frac{1}{2}(-\mu-\nu+1),\,\frac{1-\mu}{2};\,\frac{1}{2}(-\mu-\nu+3);\,\cosh^2(c\,z)\right)$$

01.24.21.0409.01

$$\int \tanh^{u}(c\,z)\,\operatorname{sech}^{\nu}(c\,z)\,dz = 2^{-u}\left(1+e^{2\,c\,z}\right)^{u+\nu}\operatorname{sech}^{u+\nu}(c\,z)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\left(\frac{(-1)^u\,e^{-c\,(u-2\,k)\,z}}{c\,(2\,k+\nu)}\,{}_2F_1\!\left(k+\frac{\nu}{2},\,u+\nu;\,k+\frac{\nu}{2}+1;\,-e^{2\,c\,z}\right)+\frac{e^{c\,(u-2\,k)\,z}}{c\,(-2\,k+2\,u+\nu)}\,{}_2F_1\!\left(-k+u+\frac{\nu}{2},\,u+\nu;\,-k+u+\frac{\nu}{2}+1;\,-e^{2\,c\,z}\right)\right)-\frac{\left(1+e^{2\,c\,z}\right)^{u+\nu}(u \bmod 2-1)\operatorname{sech}^{u+\nu}(c\,z)}{c\,(u+\nu)}\left(\frac{i}{2}\right)^{u}\binom{u}{\frac{u}{2}}\,{}_2F_1\!\left(\frac{u}{2}+\frac{\nu}{2},\,u+\nu;\,\frac{u}{2}+\frac{\nu}{2}+1;\,-e^{2\,c\,z}\right)\,/;\,u\in\mathbb{N}^+$$

01.24.21.0410.01

$$\int \tanh^2(z)\,\operatorname{sech}^2(z)\,dz = \frac{\tanh^3(z)}{3}$$

01.24.21.0411.01

$$\int \left(\tanh^{\frac{1}{a}}(c\,z)\right)^{b}\operatorname{sech}^2(c\,z)\,dz = \frac{a\tanh(c\,z)\left(\tanh^{\frac{1}{a}}(c\,z)\right)^{b}}{(a+b)\,c}$$

01.24.21.0412.01

$$\int \sqrt{\tanh^3(z)}\ \operatorname{sech}^4(z)\,dz = \frac{2}{45}\,(2\cosh(2z)+7)\operatorname{sech}^2(z)\tanh(z)\sqrt{\tanh^3(z)}$$

01.24.21.0413.01

$$\int \tanh^2\left(z+\frac{\pi}{4}\right)\operatorname{sech}^3\left(z+\frac{\pi}{4}\right)dz = \frac{1}{8}\left(-2\tanh\left(z+\frac{\pi}{4}\right)\operatorname{sech}^3\left(z+\frac{\pi}{4}\right)+\tanh\left(z+\frac{\pi}{4}\right)\operatorname{sech}\left(z+\frac{\pi}{4}\right)+2\tan^{-1}\left(\tanh\left(\frac{1}{8}(4z+\pi)\right)\right)\right)$$

01.24.21.0414.01

$$\int \tanh^5(z)\sqrt[4]{\operatorname{sech}^3(z)}\ dz = \sqrt[4]{\operatorname{sech}^3(z)}\left(-\frac{4}{19}\operatorname{sech}^4(z)+\frac{8\operatorname{sech}^2(z)}{11}-\frac{4}{3}\right)$$

01.24.21.0415.01

$$\int \tanh^5(z)\sqrt{\operatorname{sech}^3(z)}\ dz = -\frac{2}{231}\sqrt{\operatorname{sech}^3(z)}\ \left(21\operatorname{sech}^4(z)-66\operatorname{sech}^2(z)+77\right)$$

01.24.21.0416.01

$$\int \sqrt{\tanh(z)\operatorname{sech}^4(z)}\ dz = \frac{2}{3}\cosh(z)\sinh(z)\sqrt{\operatorname{sech}^4(z)\tanh(z)}$$

01.24.21.0417.01

$$\int \sqrt[3]{\tanh^2(z)\operatorname{sech}^{12}(z)}\ dz = \frac{3}{110}\cosh(z)\,(13\sinh(z)+3\sinh(3z))\sqrt[3]{\operatorname{sech}^{12}(z)\tanh^2(z)}$$

## Involving algebraic functions of tanh

01.24.21.0418.01

$$\int \frac{\left(3\tanh(z)-\sqrt{4-3\tanh(z)}\right)\operatorname{sech}^2(z)}{\sqrt{(4-3\tanh(z))^3}}\,dz = \frac{1}{3\sqrt{(4-3\tanh(z))^3}}\left(\sqrt{4-3\tanh(z)}\ \left(4\left(-\log(\cosh(z))+\log(4\cosh(z)-3\sinh(z))+4\sqrt{4-3\tanh(z)}\right)-3\left(-\log(\cosh(z))+\log(4\cosh(z)-3\sinh(z))+2\sqrt{4-3\tanh(z)}\right)\tanh(z)\right)\right)$$

01.24.21.0419.01

$$\int \frac{\tanh(z)\left(\sqrt[3]{1-8\tanh^2(z)}\ +1\right)\operatorname{sech}^2(z)}{\sqrt[3]{\left(1-8\tanh^2(z)\right)^2}}\,dz = \frac{3\,(7\cosh(2z)-9)\operatorname{sech}^2(z)\left(2^{2/3}\sqrt[3]{(9-7\cosh(2z))\operatorname{sech}^2(z)}\ +4\right)}{128\sqrt[3]{\left(1-8\tanh^2(z)\right)^2}}$$

## Involving coth

### Involving $\coth(c z)\operatorname{sech}^{\nu}(c z)$

01.24.21.0420.01

$$\int \coth(c z)\operatorname{sech}^{\nu}(c z)\,dz = -\frac{\operatorname{sech}^{\nu-2}(c z)}{c\,(2-\nu)}\,{}_2F_1\left(\frac{2-\nu}{2},1;\frac{4-\nu}{2};\cosh^2(c z)\right)$$

01.24.21.0421.01

$$\int \coth(c\,z)\,\operatorname{sech}^2(c\,z)\,dz = \frac{\log(\sinh(c\,z)) - \log(\cosh(c\,z))}{c}$$

01.24.21.0422.01

$$\int \coth(c\,z)\,\operatorname{sech}^3(c\,z)\,dz = \frac{-\log\left(\cosh\left(\frac{c\,z}{2}\right)\right) + \log\left(\sinh\left(\frac{c\,z}{2}\right)\right) + \operatorname{sech}(c\,z)}{c}$$

## Involving power of coth

### Involving $\coth^{\mu}(c\,z)\operatorname{sech}^{\nu}(c\,z)$

01.24.21.0423.01

$$\int \coth^{\mu}(c\,z)\,\operatorname{sech}^{\nu}(c\,z)\,dz = -\frac{1}{c\,(\mu-\nu+1)}\coth^{\mu}(c\,z)\,\operatorname{sech}^{\nu-1}(c\,z)\,\sinh(c\,z)\left(-\sinh^2(c\,z)\right)^{\frac{\mu-1}{2}}\,{}_2F_1\left(\frac{1}{2}(\mu-\nu+1),\,\frac{\mu+1}{2};\,\frac{1}{2}(\mu-\nu+3);\,\cosh^2(c\,z)\right)$$

## Involving csch

### Involving $\operatorname{csch}(c\,z)\operatorname{sech}^{\nu}(c\,z)$

01.24.21.0424.01

$$\int \operatorname{csch}(c\,z)\,\operatorname{sech}^{\nu}(c\,z)\,dz = \frac{\operatorname{sech}^{\nu-1}(c\,z)}{c\,(\nu-1)}\,{}_2F_1\left(\frac{1-\nu}{2},\,1;\,\frac{3-\nu}{2};\,\cosh^2(c\,z)\right)$$

01.24.21.0425.01

$$\int \operatorname{csch}(z)\,\operatorname{sech}^2(z)\,dz = -\log\left(\cosh\left(\frac{z}{2}\right)\right) + \log\left(\sinh\left(\frac{z}{2}\right)\right) + \operatorname{sech}(z)$$

01.24.21.0426.01

$$\int \operatorname{csch}(z)\,\operatorname{sech}^3(z)\,dz = \frac{\operatorname{sech}^2(z)}{2} - \log(\cosh(z)) + \log(\sinh(z))$$

01.24.21.0427.01

$$\int \operatorname{csch}(z)\,\operatorname{sech}^4(z)\,dz = \frac{\operatorname{sech}^3(z)}{3} + \operatorname{sech}(z) - \log\left(\cosh\left(\frac{z}{2}\right)\right) + \log\left(\sinh\left(\frac{z}{2}\right)\right)$$

## Involving power of csch

### Involving $\operatorname{csch}^{\mu}(c\,z)\operatorname{sech}^{\nu}(c\,z)$

01.24.21.0428.01

$$\int \operatorname{csch}^{\mu}(c\,z)\,\operatorname{sech}^{\nu}(c\,z)\,dz = \frac{\operatorname{csch}^{\mu-1}(c\,z)\,\operatorname{sech}^{\nu-1}(c\,z)\left(-\sinh^2(c\,z)\right)^{\frac{\mu-1}{2}}}{c\,(\nu-1)}\,{}_2F_1\left(\frac{1-\nu}{2},\,\frac{\mu+1}{2};\,\frac{3-\nu}{2};\,\cosh^2(c\,z)\right)$$

01.24.21.0429.01

$$\int \operatorname{csch}^2(z)\operatorname{sech}^2(z)\,dz = -\coth(z) - \tanh(z)$$

01.24.21.0430.01

$$\int \operatorname{csch}^3(z)\operatorname{sech}^2(z)\,dz = \frac{1}{2}\left(-\coth(z)\operatorname{csch}(z) + 3\log\left(\cosh\left(\frac{z}{2}\right)\right) - 3\log\left(\sinh\left(\frac{z}{2}\right)\right) - 2\operatorname{sech}(z)\right)$$

01.24.21.0431.01

$$\int \operatorname{csch}^4(z)\operatorname{sech}^2(z)\,dz = \tanh(z) - \frac{1}{3}\coth(z)\left(\operatorname{csch}^2(z) - 5\right)$$

01.24.21.0432.01

$$\int \operatorname{csch}^2(z)\operatorname{sech}^3(z)\,dz = -3\tan^{-1}\left(\tanh\left(\frac{z}{2}\right)\right) - \operatorname{csch}(z) - \frac{1}{2}\operatorname{sech}(z)\tanh(z)$$

01.24.21.0433.01

$$\int \operatorname{csch}^3(z)\operatorname{sech}^3(z)\,dz = \frac{1}{2}\left(-\operatorname{csch}^2(z) - \operatorname{sech}^2(z) + 4\log(\cosh(z)) - 4\log(\sinh(z))\right)$$

01.24.21.0434.01

$$\int \operatorname{csch}^4(z)\operatorname{sech}^3(z)\,dz = -\frac{1}{3}\operatorname{csch}^3(z) + 2\operatorname{csch}(z) + 5\tan^{-1}\left(\tanh\left(\frac{z}{2}\right)\right) + \frac{1}{2}\operatorname{sech}(z)\tanh(z)$$

01.24.21.0435.01

$$\int \operatorname{csch}^2(z)\operatorname{sech}^4(z)\,dz = -\frac{1}{3}(2\cosh(2z) + \cosh(4z))\operatorname{csch}(z)\operatorname{sech}^3(z)$$

01.24.21.0436.01

$$\int \operatorname{csch}^3(z)\operatorname{sech}^4(z)\,dz = \frac{1}{6}\left(-2\operatorname{sech}^3(z) - 12\operatorname{sech}(z) - 3\coth(z)\operatorname{csch}(z) + 15\log\left(\cosh\left(\frac{z}{2}\right)\right) - 15\log\left(\sinh\left(\frac{z}{2}\right)\right)\right)$$

01.24.21.0437.01

$$\int \operatorname{csch}^4(z)\operatorname{sech}^4(z)\,dz = \frac{1}{6}(\cosh(6z) - 3\cosh(2z))\operatorname{csch}^3(z)\operatorname{sech}^3(z)$$

01.24.21.0438.01

$$\int \operatorname{csch}^6(z)\operatorname{sech}^6(z)\,dz = -\frac{1}{30}(10\cosh(2z) - 5\cosh(6z) + \cosh(10z))\operatorname{csch}^5(z)\operatorname{sech}^5(z)$$

## Involving cosh and tanh

01.24.21.0439.01

$$\int \sqrt{a + b\cosh(2cz)}\,\tanh(cz)\operatorname{sech}^2(cz)\,dz = -\frac{\sqrt{a + b\cosh(2cz)}\,\operatorname{sech}^2(cz) + \frac{2b\tanh^{-1}\left(\frac{\sqrt{a+b\cosh(2cz)}}{\sqrt{a-b}}\right)}{\sqrt{a-b}}}{2c}$$

01.24.21.0440.01

$$\int \sqrt{a + b\cosh(2cz)}\,\tanh(cz)\operatorname{sech}^3(cz)\,dz = -\frac{(a + b\cosh(2cz))^{3/2}\operatorname{sech}^3(cz)}{3(a-b)c}$$

01.24.21.0441.01

$$\int \frac{\tanh(c\,z)\,\mathrm{sech}^2(c\,z)}{\sqrt{a+b\cosh(2\,c\,z)}}\,dz = \frac{\frac{2\,b\tanh^{-1}\left(\frac{\sqrt{a+b\cosh(2\,c\,z)}}{\sqrt{a-b}}\right)}{(a-b)^{3/2}} - \frac{\sqrt{a+b\cosh(2\,c\,z)}\,\mathrm{sech}^2(c\,z)}{a-b}}{2\,c}$$

01.24.21.0442.01

$$\int \frac{\tanh(c\,z)\,\mathrm{sech}^3(c\,z)}{\sqrt{a+b\cosh(2\,c\,z)}}\,dz = -\frac{(a-3\,b-2\,b\cosh(2\,c\,z))\sqrt{a+b\cosh(2\,c\,z)}\,\mathrm{sech}^3(c\,z)}{3\,(a-b)^2\,c}$$

01.24.21.0443.01

$$\int \frac{\tanh^2(c\,z)\,\mathrm{sech}^2(c\,z)}{\sqrt{a+b\cosh(2\,c\,z)}}\,dz = \left(\left(-2\,a^2+11\,b\,a+3\,b^2+2\left(a^2+2\,b\,a+5\,b^2\right)\cosh(2\,c\,z)+b\,(a+3\,b)\cosh(4\,c\,z)\right)\tanh(c\,z)\,\mathrm{sech}^2(c\,z) + 4\,i\left(a^2+4\,b\,a+3\,b^2\right)\sqrt{\frac{a+b\cosh(2\,c\,z)}{a+b}}\,E\left(i\,c\,z\,\middle|\,\frac{2\,b}{a+b}\right) - 4\,i\left(a^2-b^2\right)\sqrt{\frac{a+b\cosh(2\,c\,z)}{a+b}}\,F\left(i\,c\,z\,\middle|\,\frac{2\,b}{a+b}\right)\right) \Big/ \left(12\,(a-b)^2\,c\sqrt{a+b\cosh(2\,c\,z)}\right)$$

01.24.21.0444.01

$$\int \frac{\left(2\tanh^2(z)-\cosh(2\,z)\right)\mathrm{sech}^2(z)}{\sqrt{\tanh^3(z)\tanh^3(2\,z)}}\,dz = \left(\cosh^4(z)\left(\cosh(2\,z)-2\tanh^2(z)\right)\left(\sqrt{\coth^2(z)+1}\left(3\coth(z)+28\cosh(z)\sinh(z)-\tanh(z)\left(4\tanh^6(z)-8\tanh^4(z)+\tanh^2(z)+\sinh^2(z)\left(-30\tanh^4(z)+32\tanh^2(z)+26\right)-15\log(\tanh(z))\,\mathrm{sech}^2(z)\sqrt{\tanh^2(z)+1}+15\log\left(\sqrt{\tanh^2(z)+1}+1\right)\mathrm{sech}^2(z)\sqrt{\tanh^2(z)+1}+6\right)\right) - 24\,F_1\left(\frac{1}{2};1,-\frac{1}{2};\frac{3}{2};\coth^2(z),-\coth^2(z)\right)\cosh(2\,z)\,\mathrm{csch}(z)\,\mathrm{sech}^3(z)\right)\tanh^2(2\,z)\right) \Big/ \left(12\sqrt{2}\,(-2\cosh(2\,z)+\cosh(4\,z)+5)\sqrt{\coth^2(z)+1}\,\sqrt{\mathrm{sech}^3(2\,z)\sinh^6(z)}\right)$$

## Involving cosh and coth

01.24.21.0445.01

$$\int \frac{(\cosh(2\,z)-3)\,\mathrm{sech}^4(z)}{\sqrt{4-\coth^2(z)}}\,dz = -\frac{(3\cosh(2\,z)-5)\,\mathrm{csch}(z)\,\mathrm{sech}^3(z)}{6\sqrt{4-\coth^2(z)}}$$

## Involving cosh and csch

01.24.21.0446.01

$$\int \sqrt{\cosh(2\,c\,z)\,a + a}\ \operatorname{csch}(2\,c\,z)\,\operatorname{sech}^2(c\,z)\,dz = \frac{\sqrt{\cosh(2\,c\,z)\,a + a}\ \operatorname{sech}(c\,z)\left(-\log\left(\cosh\left(\frac{c\,z}{2}\right)\right) + \log\left(\sinh\left(\frac{c\,z}{2}\right)\right) + \operatorname{sech}(c\,z)\right)}{2\,c}$$

01.24.21.0447.01

$$\int \sqrt{a + b\cosh(2\,c\,z)}\ \operatorname{csch}^2(c\,z)\,\operatorname{sech}^2(c\,z)\,dz = \frac{1}{c\sqrt{a + b\cosh(2\,c\,z)}}\left(-2\,i\,(a+b)\sqrt{\frac{a + b\cosh(2\,c\,z)}{a+b}}\ E\left(i\,c\,z \,\middle|\, \frac{2\,b}{a+b}\right) - \operatorname{csch}(c\,z)\,\operatorname{sech}(c\,z)\left(\cosh(2\,c\,z)\,(a + b\cosh(2\,c\,z)) - i\,a\sqrt{\frac{a + b\cosh(2\,c\,z)}{a+b}}\ F\left(i\,c\,z \,\middle|\, \frac{2\,b}{a+b}\right)\sinh(2\,c\,z)\right)\right)$$

01.24.21.0448.01

$$\int \sqrt{a + b\cosh(2\,c\,z)}\ \operatorname{csch}^2(c\,z)\,\operatorname{sech}^3(c\,z)\,dz = \frac{\frac{(b-3\,a)\tan^{-1}\left(\frac{\sqrt{a-b}\ \sinh(c\,z)}{\sqrt{a+b\cosh(2\,c\,z)}}\right)}{\sqrt{a-b}} - \sqrt{a + b\cosh(2\,c\,z)}\ (2\operatorname{csch}(c\,z) + \operatorname{sech}(c\,z)\tanh(c\,z))}{2\,c}$$

01.24.21.0449.01

$$\int \frac{\operatorname{csch}^2(c\,z)\,\operatorname{sech}^2(c\,z)}{\sqrt{a + b\cosh(2\,c\,z)}}\,dz = \left(\operatorname{csch}(c\,z)\,\operatorname{sech}(c\,z)\left(2\cosh(2\,c\,z)\,a^2 - b\,a + b\cosh(4\,c\,z)\,a + 2\,i\,(a+b)\sqrt{\frac{a + b\cosh(2\,c\,z)}{a+b}}\ E\left(i\,c\,z \,\middle|\, \frac{2\,b}{a+b}\right)\sinh(2\,c\,z)\,a - 2\,b^2\cosh(2\,c\,z) - 2\,i\left(a^2 - b^2\right)\sqrt{\frac{a + b\cosh(2\,c\,z)}{a+b}}\ F\left(i\,c\,z \,\middle|\, \frac{2\,b}{a+b}\right)\sinh(2\,c\,z)\right)\right) \Big/ \left(2\,(b-a)\,(a+b)\,c\sqrt{a + b\cosh(2\,c\,z)}\right)$$

01.24.21.0450.01

$$\int \frac{\operatorname{csch}^2(c\,z)\,\operatorname{sech}^3(c\,z)}{\sqrt{a + b\cosh(2\,c\,z)}}\,dz = \frac{\frac{(5\,b-3\,a)\tan^{-1}\left(\frac{\sqrt{a-b}\ \sinh(c\,z)}{\sqrt{a+b\cosh(2\,c\,z)}}\right)}{(a-b)^{3/2}} + 2\sqrt{a + b\cosh(2\,c\,z)}\ \left(\frac{\operatorname{sech}(c\,z)\tanh(c\,z)}{2\,b-2\,a} - \frac{\operatorname{csch}(c\,z)}{a+b}\right)}{2\,c}$$

## Involving rational functions of the direct function and hyperbolic functions

### Involving rational functions of sinh

#### Involving $(a\sinh(z) + b\operatorname{sech}(z))^{-n}$

01.24.21.0451.01

$$\int \frac{1}{b\operatorname{sech}(z)+a\sinh(z)}\,dz = \frac{1}{\sqrt{a}\,\sqrt{(a+2\,i\,b)^2}\,\sqrt{2\,b+i\,a}} \left(\left(\frac{1}{4}+\frac{i}{4}\right)\left(4\sqrt{2\,b+i\,a}\,\sqrt{4\,b-2\,i\,a}\;i\tan^{-1}\left(\frac{\sqrt{a}\,(-1+i)+\left((1+i)\sqrt{a}-\sqrt{4\,b+2\,i\,a}\right)\tanh\left(\frac{z}{2}\right)}{\sqrt{2\,i\,a-4\,b}}\right)+\right.\right.$$

$$4\sqrt{2\,b+i\,a}\,\sqrt{4\,b-2\,i\,a}\;i\tan^{-1}\left(\frac{\sqrt{a}\,(-1+i)+\left(\sqrt{a}\,(1+i)+\sqrt{4\,b+2\,i\,a}\right)\tanh\left(\frac{z}{2}\right)}{\sqrt{2\,i\,a-4\,b}}\right)+$$

$$2\sqrt{2\,b+i\,a}\,\sqrt{4\,b-2\,i\,a}\;i\tan^{-1}\left(\frac{(1-i)\sqrt{a}-\left(\sqrt{a}\,(1+i)+\sqrt{4\,b+2\,i\,a}\right)\tanh\left(\frac{z}{2}\right)}{\sqrt{2\,i\,a-4\,b}}\right)+$$

$$2\sqrt{2\,b+i\,a}\,\sqrt{2\,i\,a-4\,b}\;i\tanh^{-1}\left(\frac{\sqrt{a}\,(-1+i)+\left((1+i)\sqrt{a}-\sqrt{4\,b+2\,i\,a}\right)\tanh\left(\frac{z}{2}\right)}{\sqrt{4\,b-2\,i\,a}}\right)+$$

$$\sqrt{2}\,\sqrt{(a+2\,i\,b)^2}\,\log\left(-(1+i)\sqrt{a}\cosh(z)+\sqrt{a}\,(1-i)\sinh(z)+\sqrt{4\,b+2\,i\,a}\right)-$$

$$\left.\left.\sqrt{2}\,\sqrt{(a+2\,i\,b)^2}\,\log\left(i\left(\sqrt{a}\,(1+i)\cosh(z)-(1-i)\sqrt{a}\sinh(z)+\sqrt{4\,b+2\,i\,a}\right)\right)\right)\right)$$

01.24.21.0452.01

$$\int \frac{1}{(b\operatorname{sech}(z)+a\sinh(z))^2}\,dz = \frac{\operatorname{sech}^2(z)\,(2\,b+a\sinh(2\,z))}{4\left(a^2+4\,b^2\right)(b\operatorname{sech}(z)+a\sinh(z))^2}\left(-\frac{4\,b^2}{a}-a+\frac{4\,b\,(2\,b+a\sinh(2\,z))}{\sqrt{-a^2-4\,b^2}}\tan^{-1}\left(\frac{a-2\,b\tanh(z)}{\sqrt{-a^2-4\,b^2}}\right)-a\cosh(2\,z)\right)$$

## Involving rational functions of cosh

### Involving $(a\cosh(z)+b\operatorname{sech}(z))^{-n}$

01.24.21.0453.01

$$\int \frac{1}{a\cosh(z)+b\operatorname{sech}(z)}\,dz = \frac{\tan^{-1}\left(\frac{\sqrt{a}\,\sinh(z)}{\sqrt{a+b}}\right)}{\sqrt{a}\,\sqrt{a+b}}$$

01.24.21.0454.01

$$\int \frac{1}{(a\cosh(z)+b\operatorname{sech}(z))^2}\,dz = \frac{(\cosh(2\,z)\,a+a+2\,b)\operatorname{sech}^2(z)}{8\,(a\cosh(z)+b\operatorname{sech}(z))^2}\left(\frac{\cosh(2\,z)\,a+a+2\,b}{\sqrt{b}\,(a+b)^{3/2}}\tanh^{-1}\left(\frac{\sqrt{b}\,\tanh(z)}{\sqrt{a+b}}\right)+\frac{\sinh(2\,z)}{a+b}\right)$$

## Involving rational functions of tanh

### Involving $(a\tanh(z)+b\operatorname{sech}(z))^{-n}$

01.24.21.0455.01

$$\int \frac{1}{a \tanh(z) + b \operatorname{sech}(z)} \, dz = \frac{\log(b + a \sinh(z))}{a}$$

01.24.21.0456.01

$$\int \frac{1}{(a \tanh(z) + b \operatorname{sech}(z))^2} \, dz = \frac{\cosh(z)}{a^2 (b + a \sinh(z))} \left( -a + z \operatorname{sech}(z) (b + a \sinh(z)) - \frac{2 b \operatorname{sech}(z) (b + a \sinh(z))}{\sqrt{-a^2 - b^2}} \tan^{-1}\left( \frac{a - b \tanh\left(\frac{z}{2}\right)}{\sqrt{-a^2 - b^2}} \right) \right)$$

## Involving rational functions of coth

### Involving $(a \coth(z) + b \operatorname{sech}(z))^{-n}$

01.24.21.0457.01

$$\int \frac{1}{a \coth(z) + b \operatorname{sech}(z)} \, dz = \left( \operatorname{csch}(z) \left( \left( b + \sqrt{b^2 - 4 a^2} \right) \log\left( b + 2 a \sinh(z) + \sqrt{b^2 - 4 a^2} \right) + \left( \sqrt{b^2 - 4 a^2} - b \right) \log\left( -b - 2 a \sinh(z) + \sqrt{b^2 - 4 a^2} \right) \right) \operatorname{sech}(z) (\cosh(2 z) a + a + 2 b \sinh(z)) \right) \Big/ \left( 4 a \sqrt{b^2 - 4 a^2} (a \coth(z) + b \operatorname{sech}(z)) \right)$$

01.24.21.0458.01

$$\int \frac{1}{(a\coth(z)+b\,\mathrm{sech}(z))^2}\,dz = \frac{1}{4a^2(a\coth(z)+b\,\mathrm{sech}(z))^2}\left(\mathrm{csch}^2(z)\,\mathrm{sech}^2(z)\,(\cosh(2z)\,a+a+2b\sinh(z))^2\left(-\left(\sqrt{2}\sqrt{-b\left(b+\sqrt{b^2-4a^2}\right)}\left(-4a^4+b\left(7b-5\sqrt{b^2-4a^2}\right)a^2+b^3\left(\sqrt{b^2-4a^2}-b\right)\right)\tan^{-1}\left(\frac{2a+\left(\sqrt{b^2-4a^2}-b\right)\tanh\left(\frac{z}{2}\right)}{\sqrt{2}\sqrt{b}\sqrt{\sqrt{b^2-4a^2}-b}}\right)+\sqrt{b}\sqrt{\sqrt{b^2-4a^2}-b}\left(\sqrt{2}\left(4a^4-b\left(7b+5\sqrt{b^2-4a^2}\right)a^2+b^3\left(b+\sqrt{b^2-4a^2}\right)\right)\tan^{-1}\left(\frac{2a-\left(b+\sqrt{b^2-4a^2}\right)\tanh\left(\frac{z}{2}\right)}{\sqrt{2}\sqrt{-b\left(b+\sqrt{b^2-4a^2}\right)}}\right)-\left(b^2-4a^2\right)^{3/2}\sqrt{-b\left(b+\sqrt{b^2-4a^2}\right)}\,z\right)\right)\Big/\left(\sqrt{b}\left(b^2-4a^2\right)^{3/2}\sqrt{\sqrt{b^2-4a^2}-b}\sqrt{-b\left(b+\sqrt{b^2-4a^2}\right)}\right)-\frac{2a\cosh(z)\left(\left(2a^2-b^2\right)\sinh(z)-a\,b\right)}{\left(4a^2-b^2\right)(\cosh(2z)\,a+a+2b\sinh(z))}\right)\right)$$

## Involving rational functions of csch

### Involving $(a\,\mathrm{csch}(z)+b\,\mathrm{sech}(z))^{-n}$

01.24.21.0459.01

$$\int \frac{1}{a\,\mathrm{csch}(z)+b\,\mathrm{sech}(z)}\,dz = \left(\mathrm{csch}(z)\,\mathrm{sech}(z)\,(a\cosh(z)+b\sinh(z))\left(a\sqrt{a-b}\,(a+b)\cosh(z)-b\left(\sqrt{a-b}\,(a+b)\sinh(z)-2a\sqrt{a+b}\tan^{-1}\left(\frac{b+a\tanh\left(\frac{z}{2}\right)}{\sqrt{a-b}\sqrt{a+b}}\right)\right)\right)\right)\Big/\left((a-b)^{3/2}(a+b)^2(a\,\mathrm{csch}(z)+b\,\mathrm{sech}(z))\right)$$

01.24.21.0460.01

$$\int \frac{1}{(a\,\mathrm{csch}(z)+b\,\mathrm{sech}(z))^2}\,dz = \frac{1}{8\,(a\,\mathrm{csch}(z)+b\,\mathrm{sech}(z))^2}\Bigg(\mathrm{csch}(z)\,\mathrm{sech}^2(z)\,(a\cosh(z)+b\sinh(z))\Bigg(\mathrm{csch}(z)\,(a\cosh(z)+b\sinh(z))\Bigg(-\frac{4\left(a^4+6\,b^2\,a^2+b^4\right)z}{(a-b)^3\,(a+b)^3}+\frac{16\,a\,b\left(a^2+b^2\right)\log(a\cosh(z)+b\sinh(z))}{\left(a^2-b^2\right)^3}+\frac{2\left(a^2+b^2\right)\sinh(2\,z)}{(a-b)^2\,(a+b)^2}-\frac{4\,a\,b\cosh(2\,z)}{(a-b)^2\,(a+b)^2}+\frac{\left(a^4+6\,b^2\,a^2+b^4\right)\sinh(z)}{a\,(a-b)^2\,(a+b)^2\,(a\cosh(z)+b\sinh(z))}\Bigg)-\frac{1}{a}\Bigg)\Bigg)$$

## Involving $\left(a\,\mathrm{csch}^2(z)+b\,\mathrm{sech}^2(z)\right)^{-n}$

01.24.21.0461.01

$$\int \frac{1}{a\,\mathrm{csch}^2(z)+b\,\mathrm{sech}^2(z)}\,dz = \frac{1}{4\,(a+b)^2}\left(2\,(b-a)\,z-4\sqrt{a}\,\sqrt{b}\,\tan^{-1}\!\left(\frac{\sqrt{b}\,\tanh(z)}{\sqrt{a}}\right)+(a+b)\sinh(2\,z)\right)$$

01.24.21.0462.01

$$\int \frac{1}{\left(a\,\mathrm{csch}^2(z)+b\,\mathrm{sech}^2(z)\right)^2}\,dz = \Bigg((a-b+(a+b)\cosh(2\,z))\,\mathrm{csch}^4(z)\,\mathrm{sech}^4(z)\Bigg(-192\,a^{3/2}\tan^{-1}\!\left(\frac{\sqrt{b}\,\tanh(z)}{\sqrt{a}}\right)b^{3/2}+96\sqrt{a}\,\tan^{-1}\!\left(\frac{\sqrt{b}\,\tanh(z)}{\sqrt{a}}\right)b^{5/2}-24\,z\,b^3+6\sinh(4\,z)\,b^3+\sinh(6\,z)\,b^3+168\,a\,z\,b^2+6\,a\sinh(4\,z)\,b^2+3\,a\sinh(6\,z)\,b^2-168\,a^2\,z\,b-6\,a^2\sinh(4\,z)\,b+3\,a^2\sinh(6\,z)\,b+96\,a^{5/2}\tan^{-1}\!\left(\frac{\sqrt{b}\,\tanh(z)}{\sqrt{a}}\right)\sqrt{b}+24\,a^3\,z+24\,(a+b)\left(\left(a^2-6\,b\,a+b^2\right)z+4\sqrt{a}\,(a-b)\sqrt{b}\,\tan^{-1}\!\left(\frac{\sqrt{b}\,\tanh(z)}{\sqrt{a}}\right)\right)\cosh(2\,z)-3\left(5\,a^3-17\,b\,a^2-17\,b^2\,a+5\,b^3\right)\sinh(2\,z)-6\,a^3\sinh(4\,z)+a^3\sinh(6\,z)\Bigg)\Bigg)\Big/\left(256\,(a+b)^4\left(a\,\mathrm{csch}^2(z)+b\,\mathrm{sech}^2(z)\right)^2\right)$$

## Involving algebraic functions of the direct function and hyperbolic functions

### Involving sinh

## Involving $\sinh(c\,z)\left(a+b\,\mathrm{sech}^2(c\,z)\right)^{\beta}$

01.24.21.0463.01

$$\int \sinh(c\,z)\left(b\,\mathrm{sech}^2(c\,z)+a\right)^{\beta}dz = -\frac{\cosh(c\,z)\left(\frac{a\cosh^2(c\,z)}{b}+1\right)^{-\beta}\left(b\,\mathrm{sech}^2(c\,z)+a\right)^{\beta}}{2\,c\,\beta-c}\,{}_2F_1\!\left(\frac{1}{2}-\beta,-\beta;\frac{3}{2}-\beta;-\frac{a\cosh^2(c\,z)}{b}\right)$$

01.24.21.0464.01

$$\int \sinh(c\,z)\,\sqrt{a+b\,\mathrm{sech}^2(c\,z)}\,dz = \frac{\cosh(c\,z)\left(\sqrt{\cosh(2\,c\,z)\,a+a+2\,b}-\sqrt{2}\,\sqrt{b}\,\tanh^{-1}\left(\frac{\sqrt{\cosh(2\,c\,z)\,a+a+2\,b}}{\sqrt{2}\,\sqrt{b}}\right)\right)\sqrt{b\,\mathrm{sech}^2(c\,z)+a}}{c\,\sqrt{\cosh(2\,c\,z)\,a+a+2\,b}}$$

01.24.21.0465.01

$$\int \frac{\sinh(c\,z)}{\sqrt{b\,\mathrm{sech}^2(c\,z)+a}}\,dz = \frac{(a+2\,b)\,\mathrm{sech}(c\,z)}{2\,a\,c\,\sqrt{b\,\mathrm{sech}^2(c\,z)+a}}\sqrt{\frac{a\cosh(2\,c\,z)}{a+2\,b}+1}\left(\sqrt{\frac{a\cosh(2\,c\,z)}{a+2\,b}+1}-1\right)$$

## Involving cosh

### Involving $\cosh(c\,z)\left(a+b\,\mathrm{sech}^2(c\,z)\right)^\beta$

01.24.21.0466.01

$$\int \cosh(c\,z)\left(a+b\,\mathrm{sech}^2(c\,z)\right)^\beta dz = -\frac{\cosh(c\,z)\left(\frac{a\cosh^2(c\,z)}{b}+1\right)^{-\beta}\coth(c\,z)\left(b\,\mathrm{sech}^2(c\,z)+a\right)^\beta\sqrt{-\sinh^2(c\,z)}}{2\,c\,(\beta-1)}F_1\left(1-\beta;\frac{1}{2},-\beta;2-\beta;\cosh^2(c\,z),-\frac{a\cosh^2(c\,z)}{b}\right)$$

01.24.21.0467.01

$$\int \cosh(c\,z)\,\sqrt{a+b\,\mathrm{sech}^2(c\,z)}\,dz = -\frac{i\,\sqrt{2}\,\cosh(c\,z)\,E\left(i\,c\,z\,\middle|\,\frac{a}{a+b}\right)\sqrt{b\,\mathrm{sech}^2(c\,z)+a}}{c\,\sqrt{\frac{\cosh(2\,c\,z)\,a+a+2\,b}{a+b}}}$$

01.24.21.0468.01

$$\int \frac{\cosh(c\,z)}{\sqrt{a+b\,\mathrm{sech}^2(c\,z)}}\,dz = -\frac{i\,\mathrm{sech}(c\,z)}{\sqrt{2}\,a\,c\,\sqrt{b\,\mathrm{sech}^2(c\,z)+a}}\sqrt{\frac{\cosh(2\,c\,z)\,a+a+2\,b}{a+b}}\left((a+b)\,E\left(i\,c\,z\,\middle|\,\frac{a}{a+b}\right)-b\,F\left(i\,c\,z\,\middle|\,\frac{a}{a+b}\right)\right)$$

## Involving tanh

### Involving $\tanh(c\,z)\left(a+b\,\mathrm{sech}^2(c\,z)\right)^\beta$

01.24.21.0469.01

$$\int \tanh(c\,z)\left(a+b\,\mathrm{sech}^2(c\,z)\right)^\beta dz = -\frac{\left(b\,\mathrm{sech}^2(c\,z)+a\right)^\beta}{2\,c\,\beta}\left(\frac{a\cosh^2(c\,z)}{b}+1\right)^{-\beta}{}_2F_1\left(-\beta,-\beta;1-\beta;-\frac{a\cosh^2(c\,z)}{b}\right)$$

01.24.21.0470.01

$$\int \tanh(c\,z)\,\sqrt{a+b\,\mathrm{sech}^2(c\,z)}\;dz = \left(\left(\sqrt{2}\,\sqrt{a}\,\cosh(c\,z)\log\left(\sqrt{2}\,\sqrt{a}\,\cosh(c\,z)+\sqrt{\cosh(2\,c\,z)\,a+a+2\,b}\right)-\sqrt{\cosh(2\,c\,z)\,a+a+2\,b}\right)\sqrt{b\,\mathrm{sech}^2(c\,z)+a}\right)\Big/ \left(c\,\sqrt{\cosh(2\,c\,z)\,a+a+2\,b}\right)$$

01.24.21.0471.01

$$\int \frac{\tanh(c\,z)}{\sqrt{a+b\,\mathrm{sech}^2(c\,z)}}\,dz = \frac{\sqrt{\cosh(2\,c\,z)\,a+a+2\,b}\,\log\left(\sqrt{2}\,\sqrt{a}\,\cosh(c\,z)+\sqrt{\cosh(2\,c\,z)\,a+a+2\,b}\right)\mathrm{sech}(c\,z)}{\sqrt{2}\,\sqrt{a}\,c\,\sqrt{b\,\mathrm{sech}^2(c\,z)+a}}$$

## Involving algebraic functions of tanh

01.24.21.0472.01

$$\int \frac{\sqrt[3]{\mathrm{sech}^6(z)\tanh(z)}-3\tanh(z)}{\left(\cosh^5(z)\sinh(z)\right)^{2/3}}\,dz = \left(3\sinh(z)\left(252\,(3\cosh(2\,z)+7)\sinh^2(z)\left(\mathrm{sech}^6(z)\tanh(z)\right)^{2/3}+5\cosh^2(z)\,(48\cosh(2\,z)+9\cosh(4\,z)+55)\left(\mathrm{sech}^6(z)\tanh(z)\right)^{4/3}-72\left(8\,\mathrm{sech}^4(z)+12\,\mathrm{sech}^2(z)+15\right)\tanh^2(z)\right)\right)\Big/ \left(1120\left(\cosh^5(z)\sinh(z)\right)^{2/3}\left(\mathrm{sech}^6(z)\tanh(z)\right)^{2/3}\left(\cosh(z)\sqrt[3]{\mathrm{sech}^6(z)\tanh(z)}-3\sinh(z)\right)\right)$$

01.24.21.0473.01

$$\int \frac{\mathrm{csch}^2(z)\left(\mathrm{sech}^2(z)-3\tanh(z)\sqrt{4\,\mathrm{sech}^2(z)+5\tanh^2(z)}\right)}{\sqrt{\left(4\,\mathrm{sech}^2(z)+5\tanh^2(z)\right)^3}}\,dz = -\left(\mathrm{csch}(z)\,\mathrm{sech}^2(z)\sqrt{(5\cosh(2\,z)+3)\,\mathrm{sech}^2(z)}\left(3\sqrt{(5\cosh(2\,z)+3)\,\mathrm{sech}^2(z)}\,\cosh(z)-3\sqrt{2}\,(\log(5\cosh(2\,z)+3)-2\log(\sinh(z)))\,(\sinh(z)+5\sinh(3\,z))+5\cosh(3\,z)\sqrt{(5\cosh(2\,z)+3)\,\mathrm{sech}^2(z)}\right)\right)\Big/ \left(64\sqrt{\left(4\,\mathrm{sech}^2(z)+5\tanh^2(z)\right)^3}\right)$$

## Involving coth

### Involving $\coth(c\,z)\left(a+b\,\mathrm{sech}^2(c\,z)\right)^\beta$

01.24.21.0474.01

$$\int \coth(c\,z)\left(a+b\,\mathrm{sech}^2(c\,z)\right)^\beta dz = \frac{\cosh^2(c\,z)\left(a+b\,\mathrm{sech}^2(c\,z)\right)^\beta}{2\,c\,\beta-2\,c}\,F_1\!\left(1-\beta;\,1,\,-\beta;\,2-\beta;\,\cosh^2(c\,z),\,-\frac{a\cosh^2(c\,z)}{b}\right)\left(\frac{a\cosh^2(c\,z)}{b}+1\right)^{-\beta}$$

01.24.21.0475.01

$$\int \coth(c z) \sqrt{a + b \operatorname{sech}^2(c z)} \, dz = \left(\cosh(c z) \left(\sqrt{2} \sqrt{a} \log\left(\sqrt{2} \sqrt{a} \cosh(c z) + \sqrt{\cosh(2 c z) a + a + 2 b}\right) - \sqrt{2 a + 2 b} \tanh^{-1}\left(\frac{\sqrt{2 a + 2 b} \cosh(c z)}{\sqrt{\cosh(2 c z) a + a + 2 b}}\right)\right) \sqrt{b \operatorname{sech}^2(c z) + a}\right) \Big/ \left(c \sqrt{\cosh(2 c z) a + a + 2 b}\right)$$

01.24.21.0476.01

$$\int \frac{\coth(c z)}{\sqrt{a + b \operatorname{sech}^2(c z)}} \, dz = -\frac{\sqrt{\cosh(2 c z) a + a + 2 b} \operatorname{sech}(c z)}{\sqrt{a} \sqrt{2 a + 2 b} \, c \sqrt{b \operatorname{sech}^2(c z) + a}} \left(\sqrt{a} \tanh^{-1}\left(\frac{\sqrt{2 a + 2 b} \cosh(c z)}{\sqrt{\cosh(2 c z) a + a + 2 b}}\right) - \sqrt{a + b} \log\left(\sqrt{2} \sqrt{a} \cosh(c z) + \sqrt{\cosh(2 c z) a + a + 2 b}\right)\right)$$

## Involving sinh, cosh and tanh

01.24.21.0477.01

$$\int \frac{\left(\sinh^2(z) + 3\right) \tanh^3(z)}{\left(\cosh^2(z) - 2\right) \sqrt{\left(5 - 4 \operatorname{sech}^2(z)\right)^3}} \, dz = \left(\operatorname{sech}^2(z) \left(\frac{1}{15 \sqrt{\cosh(2 z) + 1}} \left(\left(36 \sqrt{5} \sinh^{-1}\left(\frac{\sqrt{5 \cosh(2 z) - 3}}{2 \sqrt{2}}\right) \cosh(z) - 5 \sqrt{3} \left(14 \sqrt{\cosh^2(z)} \tanh^{-1}\left(\frac{\sqrt{6} \cosh(z)}{\sqrt{5 \cosh(2 z) - 3}}\right) + 3 \cosh(z) \left(-\log\left(5 \sqrt{6} \sqrt{\cosh^2(z)} - 3 \sqrt{5 \cosh(2 z) - 3} + 4 \sqrt{3}\right) - \log\left(2 \sqrt{3} - \sqrt{5 \cosh(2 z) - 3}\right) + \log\left(\sqrt{5 \cosh(2 z) - 3} + 2 \sqrt{3}\right) + \log\left(5 \sqrt{6} \sqrt{\cosh^2(z)} + 3 \sqrt{5 \cosh(2 z) - 3} + 4 \sqrt{3}\right)\right)\right)\right) \operatorname{sech}(z) (5 \cosh(2 z) - 3)^{3/2}\right) - 35 \cosh(2 z) + 21\right)\right) \Big/ \left(120 \sqrt{\left(5 - 4 \operatorname{sech}^2(z)\right)^3}\right)$$

**Involving functions of the direct function, hyperbolic and a power functions**

## Involving powers of the direct function, hyperbolic and a power functions

## Involving sinh and power

### Involving $z^n \sinh(a + b z) \operatorname{sech}^\nu(c z)$

01.24.21.0478.01

$$\int z^n \sinh(a+b\,z)\,\text{sech}^\nu(c\,z)\,dz = \frac{1}{2}\left(1+e^{2\,c\,z}\right)^\nu \text{sech}^\nu(c\,z)\,n!\left(e^{a+b\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(b+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{c\,\nu+b}{2\,c},\,\ldots,\,\frac{c\,\nu+b}{2\,c},\,\nu;\,\frac{c\,\nu+b}{2\,c}+1,\,\ldots,\,\frac{c\,\nu+b}{2\,c}+1;\,-e^{2\,c\,z}\right) - e^{-a-b\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(-b+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{c\,\nu-b}{2\,c},\,\ldots,\,\frac{c\,\nu-b}{2\,c},\,\nu;\,\frac{c\,\nu-b}{2\,c}+1,\,\ldots,\,\frac{c\,\nu-b}{2\,c}+1;\,-e^{2\,c\,z}\right)\right)/;\,n\in\mathbb{N}$$

01.24.21.0479.01

$$\int z^n \sinh(b\,z)\,\text{sech}^\nu(c\,z)\,dz = \frac{1}{2}\left(1+e^{2\,c\,z}\right)^\nu n!\,\text{sech}^\nu(c\,z)\left(-e^{-b\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(-b+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{c\,\nu-b}{2\,c},\,\ldots,\,\frac{c\,\nu-b}{2\,c},\,\nu;\,\frac{c\,\nu-b}{2\,c}+1,\,\ldots,\,\frac{c\,\nu-b}{2\,c}+1;\,-e^{2\,c\,z}\right) + e^{b\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(b+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{c\,\nu+b}{2\,c},\,\ldots,\,\frac{c\,\nu+b}{2\,c},\,\nu;\,\frac{c\,\nu+b}{2\,c}+1,\,\ldots,\,\frac{c\,\nu+b}{2\,c}+1;\,-e^{2\,c\,z}\right)\right)/;\,n\in\mathbb{N}$$

01.24.21.0480.01

$$\int z^n \sinh(c\,\nu\,z)\,\text{sech}^\nu(c\,z)\,dz = \frac{1}{2}\left(1+e^{2\,c\,z}\right)^\nu \text{sech}^\nu(c\,z)\left(-\frac{e^{-c\,\nu\,z}\,z^{n+1}}{n+1} + e^{-c\,(\nu-2)\,z}\,\nu\,n!\sum_{j=0}^{n}\frac{(-1)^j\,(2\,c)^{-j-1}\,z^{n-j}}{(n-j)!}\,{}_{j+3}F_{j+2}\!\left(1,\,\ldots,\,1,\,\nu+1;\,2,\,\ldots,\,2;\,-e^{2\,c\,z}\right) + e^{c\,\nu\,z}\,n!\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}}{(n-j)!\,(2\,c\,\nu)^{j+1}}\,{}_{j+2}F_{j+1}\!\left(\nu,\,\ldots,\,\nu,\,\nu;\,\nu+1,\,\ldots,\,\nu+1;\,-e^{2\,c\,z}\right)\right)/;\,n\in\mathbb{N}$$

01.24.21.0481.01

$$\int z^n \sinh(q\,\nu\,c\,z)\,\text{sech}^\nu(c\,z)\,dz = \frac{1}{2}\,n!\,\text{sech}^\nu(c\,z)\left(1+e^{2\,c\,z}\right)^\nu\left(-\frac{(-1)^{\frac{\nu(q-1)}{2}}\,e^{-c\,\nu\,z}\,\Gamma\!\left(\frac{\nu(q+1)}{2}\right)z^{n+1}}{\Gamma\!\left(\frac{\nu(q-1)}{2}+1\right)\Gamma(\nu)\,(n+1)!} + e^{q\,\nu\,c\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}}{(n-j)!\,(c\,\nu\,(q+1))^{j+1}}\,{}_{j+2}F_{j+1}\!\left(\frac{\nu\,(q+1)}{2},\,\ldots,\,\frac{\nu\,(q+1)}{2},\,\nu;\,\frac{\nu\,(q+1)}{2}+1,\,\ldots,\,\frac{\nu\,(q+1)}{2}+1;\,-e^{2\,c\,z}\right) - (-1)^{\frac{\nu(q-1)}{2}}\sum_{j=0}^{n}\frac{e^{c\,z\,(2-\nu)}\,(\nu)_{\frac{\nu(q-1)}{2}+1}\,z^{n-j}}{(n-j)!\,(-2\,c)^{j+1}\left(\frac{\nu(q-1)}{2}+1\right)!}\,{}_{j+3}F_{j+2}\!\left(1,\,\ldots,\,1,\,\frac{(q+1)\,\nu}{2}+1;\,2,\,\ldots,\,2,\,\frac{(q-1)\,\nu}{2}+2;\,-e^{2\,c\,z}\right) + \sum_{j=0}^{n}\sum_{k=0}^{\frac{\nu(q-1)}{2}-1}\frac{(-1)^k\,(\nu)_k\,z^{n-j}\,e^{c\,z\,(2\,k-q\,\nu)}}{(c\,(-2\,k+q\,\nu-\nu))^{j+1}\,(n-j)!\,k!}\right)/;\,n\in\mathbb{N}\bigwedge\frac{(q-1)\,\nu}{2}\in\mathbb{N}^+$$

## Involving powers of sinh and power

### Involving $z^n \sinh^u(b\,z)\,\text{sech}^\nu(c\,z)$

01.24.21.0482.01

$$\int z^n \sinh^u(b z) \operatorname{sech}^\nu(c z) \, dz = \left(1+e^{2cz}\right)^\nu \binom{u}{\frac{u}{2}} \left(\frac{i}{2}\right)^u n! \, (1 - u \bmod 2) \operatorname{sech}^\nu(c z) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{\nu}{2}, \ldots, \frac{\nu}{2}, \nu; \frac{\nu}{2}+1, \ldots, \frac{\nu}{2}+1; -e^{2cz}\right) + 2^{-u} \left(1+e^{2cz}\right)^\nu i^u n! \operatorname{sech}^\nu(c z) \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{u}{k} \left( e^{(b(u-2k))z - \frac{i\pi u}{2}} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b(u-2k)+c\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c\nu+b(-2k+u)}{2c}, \ldots, \frac{c\nu+b(-2k+u)}{2c}, \nu; \frac{c\nu+b(-2k+u)}{2c}+1, \ldots, \frac{c\nu+b(-2k+u)}{2c}+1; -e^{2cz}\right) + e^{\frac{i\pi u}{2}+(-b(u-2k))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-b(u-2k)+c\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c\nu-b(-2k+u)}{2c}, \ldots, \frac{c\nu-b(-2k+u)}{2c}, \nu; \frac{c\nu-b(-2k+u)}{2c}+1, \ldots, \frac{c\nu-b(-2k+u)}{2c}+1; -e^{2cz}\right)\right) /; n \in \mathbb{N} \land u \in \mathbb{N}^+$$

## Involving cosh and power

### Involving $z^n \cosh(a + b z) \operatorname{sech}^\nu(c z)$

01.24.21.0483.01

$$\int z^n \cosh(a+bz) \operatorname{sech}^\nu(c z) \, dz = \frac{1}{2} \left(1+e^{2cz}\right)^\nu \operatorname{sech}^\nu(c z) \, n! \left( e^{a+bz} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b+c\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c\nu+b}{2c}, \ldots, \frac{c\nu+b}{2c}, \nu; \frac{c\nu+b}{2c}+1, \ldots, \frac{c\nu+b}{2c}+1; -e^{2cz}\right) + e^{-a-bz} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-b+c\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c\nu-b}{2c}, \ldots, \frac{c\nu-b}{2c}, \nu; \frac{c\nu-b}{2c}+1, \ldots, \frac{c\nu-b}{2c}+1; -e^{2cz}\right)\right) /; n \in \mathbb{N}$$

01.24.21.0484.01

$$\int z^n \cosh(bz) \operatorname{sech}^\nu(c z) \, dz = \frac{1}{2} \left(1+e^{2cz}\right)^\nu n! \operatorname{sech}^\nu(c z) \left( e^{-bz} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-b+c\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c\nu-b}{2c}, \ldots, \frac{c\nu-b}{2c}, \nu; \frac{c\nu-b}{2c}+1, \ldots, \frac{c\nu-b}{2c}+1; -e^{2cz}\right) + e^{bz} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b+c\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c\nu+b}{2c}, \ldots, \frac{c\nu+b}{2c}, \nu; \frac{c\nu+b}{2c}+1, \ldots, \frac{c\nu+b}{2c}+1; -e^{2cz}\right)\right) /; n \in \mathbb{N}$$

01.24.21.0485.01

$$\int z^n \cosh(c\,\nu\,z)\,\mathrm{sech}^\nu(c\,z)\,dz = \frac{1}{2}\left(1+e^{2cz}\right)^\nu \mathrm{sech}^\nu(c\,z)\left(\frac{e^{-c\nu z} z^{n+1}}{n+1} - e^{-c(\nu-2)z}\,\nu\,n!\sum_{j=0}^{n}\frac{(-1)^j (2c)^{-j-1} z^{n-j}}{(n-j)!}\,{}_{j+3}F_{j+2}\left(1,\ldots,1,\nu+1;2,\ldots,2;-e^{2cz}\right) + e^{c\nu z}\,n!\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}}{(n-j)!\,(2c\nu)^{j+1}}\,{}_{j+2}F_{j+1}\left(\nu,\ldots,\nu,\nu;\nu+1,\ldots,\nu+1;-e^{2cz}\right)\right)/;\, n\in\mathbb{N}$$

01.24.21.0486.01

$$\int z^n \cosh(q\,\nu\,c\,z)\,\mathrm{sech}^\nu(c\,z)\,dz = \frac{1}{2}\,n!\,\mathrm{sech}^\nu(c\,z)\left(1+e^{2cz}\right)^\nu\left(\frac{(-1)^{\frac{\nu(q-1)}{2}} e^{-c\nu z}\,\Gamma\left(\frac{\nu(q+1)}{2}\right) z^{n+1}}{\Gamma\left(\frac{\nu(q-1)}{2}+1\right)\Gamma(\nu)\,(n+1)!} + e^{q\nu cz}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}}{(n-j)!\,(c\,\nu\,(q+1))^{j+1}}\,{}_{j+2}F_{j+1}\left(\frac{\nu(q+1)}{2},\ldots,\frac{\nu(q+1)}{2},\nu;\frac{\nu(q+1)}{2}+1,\ldots,\frac{\nu(q+1)}{2}+1;-e^{2cz}\right) + (-1)^{\frac{\nu(q-1)}{2}}\sum_{j=0}^{n}\frac{e^{cz(2-\nu)}\,(\nu)_{\frac{\nu(q-1)}{2}+1}\,z^{n-j}}{(n-j)!\,(-2c)^{j+1}\left(\frac{\nu(q-1)}{2}+1\right)!}\,{}_{j+3}F_{j+2}\left(1,\ldots,1,\frac{(q+1)\nu}{2}+1;2,\ldots,2,\frac{(q-1)\nu}{2}+2;-e^{2cz}\right) - \sum_{j=0}^{n}\sum_{k=0}^{\frac{\nu(q-1)}{2}-1}\frac{(-1)^k (\nu)_k\,z^{n-j}\,e^{cz(2k-q\nu)}}{(c(-2k+q\nu-\nu))^{j+1}\,(n-j)!\,k!}\right)/;\, n\in\mathbb{N}\bigwedge\frac{(q-1)\nu}{2}\in\mathbb{N}^+$$

## Involving powers of cosh and power

### Involving $z^n \cosh^u(b\,z)\,\mathrm{sech}^\nu(c\,z)$

01.24.21.0487.01

$$\int z^n \cosh^u(b\,z)\,\mathrm{sech}^\nu(c\,z)\,dz = \left(1+e^{2cz}\right)^\nu\binom{u}{\frac{u}{2}}2^{-u}\,n!\,(1-u\bmod 2)\,\mathrm{sech}^\nu(c\,z)\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{\nu}{2},\ldots,\frac{\nu}{2},\nu;\frac{\nu}{2}+1,\ldots,\frac{\nu}{2}+1;-e^{2cz}\right) + 2^{-u}\left(1+e^{2cz}\right)^\nu n!\,\mathrm{sech}^\nu(c\,z)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{k}\left(e^{(b(u-2k))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(b(u-2k)+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{c\nu+b(-2k+u)}{2c},\ldots,\frac{c\nu+b(-2k+u)}{2c},\nu;\frac{c\nu+b(-2k+u)}{2c}+1,\ldots,\frac{c\nu+b(-2k+u)}{2c}+1;-e^{2cz}\right) + e^{(-b(u-2k))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(-b(u-2k)+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{c\nu-b(-2k+u)}{2c},\ldots,\frac{c\nu-b(-2k+u)}{2c},\nu;\frac{c\nu-b(-2k+u)}{2c}+1,\ldots,\frac{c\nu-b(-2k+u)}{2c}+1;-e^{2cz}\right)\right)/;\, n\in\mathbb{N}\bigwedge u\in\mathbb{N}^+$$

## Involving tanh and power

### Involving $z^n \tanh(c\,z)\,\text{sech}^\nu(c\,z)$

01.24.21.0488.01

$$\int z^n \tanh(c\,z)\,\text{sech}^\nu(c\,z)\,dz = \frac{1}{2}\left(1+e^{2cz}\right)^{\nu+1} n!\,\text{sech}^{\nu+1}(c\,z) \left(e^{cz}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(c\,(\nu+2))^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{\nu+2}{2},\,\ldots,\,\frac{\nu+2}{2},\,\nu+1;\,\frac{\nu+2}{2}+1,\,\ldots,\,\frac{\nu+2}{2}+1;\,-e^{2cz}\right) - e^{-cz}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{\nu}{2},\,\ldots,\,\frac{\nu}{2},\,\nu+1;\,\frac{\nu}{2}+1,\,\ldots,\,\frac{\nu}{2}+1;\,-e^{2cz}\right)\right) /;\; n\in\mathbb{N}$$

01.24.21.0489.01

$$\int z\tanh(c\,z)\,\text{sech}^2(c\,z)\,dz = \frac{\tanh(c\,z)-c\,z\,\text{sech}^2(c\,z)}{2\,c^2}$$

## Involving powers of tanh and power

### Involving $z^n\, e^{p\,z} \tanh^u(c\,z)\,\text{sech}^\nu(c\,z)$

01.24.21.0490.01

$$\int z^n \tanh^u(c\,z)\,\text{sech}^\nu(c\,z)\,dz = \left(1+e^{2cz}\right)^{u+\nu}\binom{u}{\frac{u}{2}} n!\,(1-u \bmod 2)\,\text{sech}^{u+\nu}(c\,z) \left(\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}\,(c\,(u+\nu))^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{u+\nu}{2},\,\ldots,\,\frac{u+\nu}{2},\,u+\nu;\,\frac{u+\nu}{2}+1,\,\ldots,\,\frac{u+\nu}{2}+1;\,-e^{2cz}\right)\right)\left(\frac{i}{2}\right)^u + 2^{-u}\left(1+e^{2cz}\right)^{u+\nu} n!\,\text{sech}^{u+\nu}(c\,z)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\left((-1)^u e^{(-c\,(u-2k))z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}\,(c\,(2k+\nu))^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{1}{2}(2k+\nu),\,\ldots,\,\frac{1}{2}(2k+\nu),\,u+\nu;\,\frac{1}{2}(2k+\nu)+1,\,\ldots,\,\frac{1}{2}(2k+\nu)+1;\,-e^{2cz}\right) + e^{(c\,(u-2k))z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}\,(c\,(-2k+2u+\nu))^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{1}{2}(-2k+2u+\nu),\,\ldots,\,\frac{1}{2}(-2k+2u+\nu),\,u+\nu;\,\frac{1}{2}(-2k+2u+\nu)+1,\,\ldots,\,\frac{1}{2}(-2k+2u+\nu)+1;\,-e^{2cz}\right)\right) /;\; n\in\mathbb{N}\land u\in\mathbb{N}^+$$

## Involving powers of coth and power

### Involving $z^n \coth^u(c\,z)\,\text{sech}^\nu(c\,z)$

01.24.21.0491.01

$$\int z^n \coth^u(c z) \operatorname{sech}^\nu(c z)\, dz = (-1)^u 2^\nu e^{c u z} \binom{u-\nu}{\frac{u-\nu}{2}} n! \,(1-(u-\nu) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (c u)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{u}{2}, \ldots, \frac{u}{2}, u; \frac{u}{2}+1, \ldots, \frac{u}{2}+1; e^{2 c z}\right) + (-1)^u 2^\nu e^{c u z} n! \sum_{k=0}^{\left\lfloor \frac{1}{2}(u-\nu-1)\right\rfloor} \binom{u-\nu}{k} \left(e^{c(-2k+u-\nu)z} \sum_{j=0}^{n} \frac{(-1)^j (c(-2k+2u-\nu))^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{1}{2}(-2k+2u-\nu), \ldots, \frac{1}{2}(-2k+2u-\nu), u; \frac{1}{2}(-2k+2u-\nu)+1, \ldots, \frac{1}{2}(-2k+2u-\nu)+1; e^{2 c z}\right) + e^{-c(-2k+u-\nu)z} \sum_{j=0}^{n} \frac{(-1)^j (c(2k+\nu))^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{1}{2}(2k+\nu), \ldots, \frac{1}{2}(2k+\nu), u; \frac{1}{2}(2k+\nu)+1, \ldots, \frac{1}{2}(2k+\nu)+1; e^{2 c z}\right)\right) /; n \in \mathbb{N} \land u \in \mathbb{Z} \land u \geq \nu \land \nu \in \mathbb{N}^+$$

**Involving functions of the direct function, hyperbolic and exponential functions**

## Involving powers of the direct function, hyperbolic and exponential functions

### Involving sinh and exp

### Involving $e^{p z} \sinh(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0492.01

$$\int e^{p z} \sinh(b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{2}\left(1+e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \left(\frac{e^{(b+p)z} \, {}_2F_1\left(\frac{b}{2c}+\frac{p}{2c}+\frac{\nu}{2}, \nu; \frac{b}{2c}+\frac{p}{2c}+\frac{\nu}{2}+1; -e^{2 c z}\right)}{b+p+c\nu} - \frac{e^{(p-b)z} \, {}_2F_1\left(-\frac{b}{2c}+\frac{p}{2c}+\frac{\nu}{2}, \nu; -\frac{b}{2c}+\frac{p}{2c}+\frac{\nu}{2}+1; -e^{2 c z}\right)}{-b+p+c\nu}\right)$$

01.24.21.0493.01

$$\int e^{(b-c\nu)z} \sinh(b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{2}\left(1+e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \left(-e^{-c z \nu} z + \frac{e^{z(2b-c\nu)} \, {}_2F_1\left(\frac{b}{c}, \nu; \frac{b}{c}+1; -e^{2 c z}\right)}{2b} + \frac{e^{c z(2-\nu)} \nu \, {}_3F_2\left(1, 1, \nu+1; 2, 2; -e^{2 c z}\right)}{2c}\right)$$

01.24.21.0494.01

$$\int e^{-(b+c\nu)z} \sinh(b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{2}\left(1+e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \left(e^{-c z \nu} z + \frac{e^{-z(2b+c\nu)} \, {}_2F_1\left(-\frac{b}{c}, \nu; 1-\frac{b}{c}; -e^{2 c z}\right)}{2b} - \frac{e^{c z(2-\nu)} \nu \, {}_3F_2\left(1, 1, \nu+1; 2, 2; -e^{2 c z}\right)}{2c}\right)$$

### Involving powers of sinh and exp

## Involving $e^{pz} \sinh^u(bz) \operatorname{sech}^\nu(cz)$

01.24.21.0495.01

$$\int e^{pz} \sinh^u(bz) \operatorname{sech}^\nu(cz)\, dz = i^u\, 2^{-u} \left(1+e^{2cz}\right)^\nu \operatorname{sech}^\nu(cz) \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{u}{k}$$

$$\left(\frac{1}{p+b(u-2k)+c\nu}\left(e^{(p+b(u-2k))z-\frac{i\pi u}{2}}\, {}_2F_1\left(-\frac{bk}{c}+\frac{p}{2c}+\frac{bu}{2c}+\frac{\nu}{2},\, \nu;\, -\frac{bk}{c}+\frac{p}{2c}+\frac{bu}{2c}+\frac{\nu}{2}+1;\, -e^{2cz}\right)\right)+\right.$$

$$\left.\frac{e^{\frac{i\pi u}{2}+(p-b(u-2k))z}\, {}_2F_1\left(\frac{bk}{c}+\frac{p}{2c}+\frac{\nu}{2}-\frac{bu}{2c},\, \nu;\, \frac{bk}{c}+\frac{p}{2c}+\frac{\nu}{2}-\frac{bu}{2c}+1;\, -e^{2cz}\right)}{p-b(u-2k)+c\nu}\right)-$$

$$\frac{e^{pz}\left(1+e^{2cz}\right)^\nu (u \bmod 2-1) \operatorname{sech}^\nu(cz)}{p+c\nu} \left(\frac{i}{2}\right)^u \binom{u}{\frac{u}{2}}\, {}_2F_1\left(\frac{p}{2c}+\frac{\nu}{2},\, \nu;\, \frac{p}{2c}+\frac{\nu}{2}+1;\, -e^{2cz}\right) /;\, u \in \mathbb{N}^+$$

01.24.21.0496.01

$$\int e^{pz} \sinh^\mu(cz) \operatorname{sech}^\nu(cz)\, dz =$$

$$\frac{e^{pz}\left(1-e^{-2cz}\right)^{-\mu}\left(1+e^{-2cz}\right)^\nu \operatorname{sech}^\nu(cz) \sinh^\mu(cz)}{p+c(\mu-\nu)} F_1\left(-\frac{p+c\mu-c\nu}{2c};\, \nu,\, -\mu;\, \frac{c(-\mu+\nu+2)-p}{2c};\, -e^{-2cz},\, e^{-2cz}\right)$$

01.24.21.0497.01

$$\int e^{c(\nu-\mu)z} \sinh^\mu(cz) \operatorname{sech}^\nu(cz)\, dz =$$

$$\frac{e^{c(\nu-\mu)z}\left(1-e^{2cz}\right)^{-\mu}\left(1+e^{2cz}\right)^\nu \operatorname{sech}^\nu(cz) \sinh^\mu(cz)}{2c(\nu-\mu)} F_1\left(\nu-\mu;\, -\mu,\, \nu;\, -\mu+\nu+1;\, e^{2cz},\, -e^{2cz}\right)$$

# Involving cosh and exp

## Involving $e^{pz} \cosh(bz) \operatorname{sech}^\nu(cz)$

01.24.21.0498.01

$$\int e^{pz} \cosh(bz) \operatorname{sech}^\nu(cz)\, dz = \frac{1}{2}\left(1+e^{2cz}\right)^\nu \operatorname{sech}^\nu(cz)$$

$$\left(\frac{e^{(b+p)z}\, {}_2F_1\left(\frac{b}{2c}+\frac{p}{2c}+\frac{\nu}{2},\, \nu;\, \frac{b}{2c}+\frac{p}{2c}+\frac{\nu}{2}+1;\, -e^{2cz}\right)}{b+p+c\nu}+\frac{e^{(p-b)z}\, {}_2F_1\left(-\frac{b}{2c}+\frac{p}{2c}+\frac{\nu}{2},\, \nu;\, -\frac{b}{2c}+\frac{p}{2c}+\frac{\nu}{2}+1;\, -e^{2cz}\right)}{-b+p+c\nu}\right)$$

01.24.21.0499.01

$$\int e^{(b-c\nu)z} \cosh(bz) \operatorname{sech}^\nu(cz)\, dz =$$

$$\frac{1}{2}\left(1+e^{2cz}\right)^\nu \operatorname{sech}^\nu(cz)\left(e^{-cz\nu} z+\frac{e^{z(2b-c\nu)}\, {}_2F_1\left(\frac{b}{c},\, \nu;\, \frac{b}{c}+1;\, -e^{2cz}\right)}{2b}-\frac{e^{cz(2-\nu)}\, \nu\, {}_3F_2\left(1,\, 1,\, \nu+1;\, 2,\, 2;\, -e^{2cz}\right)}{2c}\right)$$

01.24.21.0500.01

$$\int e^{-(b+c\nu)z} \cosh(b z)\, \operatorname{sech}^{\nu}(c z)\, dz = \frac{1}{2}\left(1+e^{2cz}\right)^{\nu} \operatorname{sech}^{\nu}(c z) \left(e^{-cz\nu} z - \frac{e^{cz(2-\nu)}\, \nu\, {}_3F_2\left(1, 1, \nu+1; 2, 2; -e^{2cz}\right)}{2c} - \frac{e^{-z(2b+c\nu)}\, {}_2F_1\left(-\frac{b}{c}, \nu; 1-\frac{b}{c}; -e^{2cz}\right)}{2b}\right)$$

Involving powers of cosh and exp

## Involving $e^{pz} \cosh^{u}(b z) \operatorname{sech}^{\nu}(c z)$

01.24.21.0501.01

$$\int e^{pz} \cosh^{u}(b z)\, \operatorname{sech}^{\nu}(c z)\, dz = 2^{-u}\left(1+e^{2cz}\right)^{\nu} \operatorname{sech}^{\nu}(c z) \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(\frac{e^{(p+b(u-2s))z}\, {}_2F_1\left(\frac{p}{2c}+\frac{bu}{2c}+\frac{\nu}{2}-\frac{bs}{c}, \nu; \frac{p}{2c}+\frac{bu}{2c}+\frac{\nu}{2}-\frac{bs}{c}+1; -e^{2cz}\right)}{p+b(u-2s)+c\nu} + \frac{e^{(p-b(u-2s))z}\, {}_2F_1\left(\frac{p}{2c}+\frac{bs}{c}+\frac{\nu}{2}-\frac{bu}{2c}, \nu; \frac{p}{2c}+\frac{bs}{c}+\frac{\nu}{2}-\frac{bu}{2c}+1; -e^{2cz}\right)}{p-b(u-2s)+c\nu}\right) - \frac{2^{-u} e^{pz}\left(1+e^{2cz}\right)^{\nu} (u \bmod 2 - 1) \operatorname{sech}^{\nu}(c z)}{p+c\nu} \binom{u}{\frac{u}{2}} {}_2F_1\left(\frac{p}{2c}+\frac{\nu}{2}, \nu; \frac{p}{2c}+\frac{\nu}{2}+1; -e^{2cz}\right) /; u \in \mathbb{N}^{+}$$

01.24.21.0502.01

$$\int e^{pz} \cosh^{\mu}(c z)\, \operatorname{sech}^{\nu}(c z)\, dz = \frac{e^{pz}\left(1+e^{2cz}\right)^{\nu-\mu} \cosh^{\mu}(c z) \operatorname{sech}^{\nu}(c z)}{p+c(\nu-\mu)}\, {}_2F_1\left(\frac{p-c\mu+c\nu}{2c}, \nu-\mu; \frac{p+c(-\mu+\nu+2)}{2c}; -e^{2cz}\right)$$

01.24.21.0503.01

$$\int e^{c(\mu-\nu)z} \cosh^{\mu}(c z)\, \operatorname{sech}^{\nu}(c z)\, dz = \frac{e^{cz(\mu-\nu)}\left(1+e^{-2cz}\right)^{\nu-\mu} \cosh^{\mu}(c z) \operatorname{sech}^{\nu}(c z)}{2c(\mu-\nu)}\, {}_2F_1\left(\nu-\mu, \nu-\mu; -\mu+\nu+1; -e^{-2cz}\right)$$

Involving tanh and exp

## Involving $e^{pz} \tanh(c z) \operatorname{sech}^{\nu}(c z)$

01.24.21.0504.01

$$\int e^{pz} \tanh(c z)\, \operatorname{sech}^{\nu}(c z)\, dz = -\frac{2^{\nu} e^{pz}\left(e^{-cz}+e^{cz}\right)^{-\nu}\left(1+e^{2cz}\right)^{\nu} \cosh^{\nu}(c z) \operatorname{sech}^{\nu}(c z)}{p+c\nu} F_1\left(\frac{p+c\nu}{2c}; -1, \nu+1; \frac{p+c(\nu+2)}{2c}; e^{2cz}, -e^{2cz}\right)$$

01.24.21.0505.01

$$\int e^{p z} \tanh(c z) \operatorname{sech}^{\nu}(c z)\, dz = e^{(p-2c)z} \left(1 + e^{-2cz}\right)^{\nu} \operatorname{sech}^{\nu}(c z) \left( \frac{2c\left(1 - e^{-2cz}\right)(\nu+1)}{(c(\nu+2)-p)(c(\nu+4)-p)}\, {}_2F_1\!\left(-\frac{p}{2c} + \frac{\nu}{2} + 1, \nu+2; -\frac{p}{2c} + \frac{\nu}{2} + 3; -e^{-2cz}\right) - \frac{\left(p - c\nu + e^{2cz}(c(\nu+2)-p)\right)}{(p-c\nu)(p-c(\nu+2))}\, {}_2F_1\!\left(\frac{\nu}{2} - \frac{p}{2c}, \nu+1; -\frac{p}{2c} + \frac{\nu}{2} + 2; -e^{-2cz}\right)\right)$$

01.24.21.0506.01

$$\int e^{-c\nu z} \tanh(c z) \operatorname{sech}^{\nu}(c z)\, dz = \frac{e^{-2cz - c\nu z} \operatorname{sech}^{\nu}(c z)}{2c\nu(\nu+1)} \left(\nu\, {}_2F_1\!\left(\nu+1, \nu+1; \nu+2; -e^{-2cz}\right)\left(1 + e^{-2cz}\right)^{\nu} + e^{2cz}\left(\left(1 + e^{2cz}\right)^{\nu} - 1\right)(\nu+1)\right)$$

01.24.21.0507.01

$$\int e^{c\nu z} \tanh(c z) \operatorname{sech}^{\nu}(c z)\, dz = \frac{e^{cz\nu} \operatorname{sech}^{\nu}(c z)}{2c\nu(\nu+1)} \left(e^{2cz}\nu\, {}_2F_1\!\left(\nu+1, \nu+1; \nu+2; -e^{2cz}\right)\left(1 + e^{2cz}\right)^{\nu} - \nu - 1\right)$$

01.24.21.0508.01

$$\int e^{c(\nu+2)z} \tanh(c z) \operatorname{sech}^{\nu}(c z)\, dz = \frac{1}{2c(\nu+1)(\nu+2)} \operatorname{sech}^{\nu}(c z)\, e^{cz(\nu+2)} \left(1 + e^{2cz}\right)^{\nu} \left(e^{2cz}(\nu+1)\, {}_2F_1\!\left(\nu+2, \nu+1; \nu+3; -e^{2cz}\right) - (\nu+2)\, {}_2F_1\!\left(\nu+1, \nu+1; \nu+2; -e^{2cz}\right)\right)$$

01.24.21.0509.01

$$\int e^{c(\nu+4)z} \tanh(c z) \operatorname{sech}^{\nu}(c z)\, dz = \frac{1}{2c(\nu+2)(\nu+3)} e^{cz(\nu+4)} \left(1 + e^{2cz}\right)^{\nu} \operatorname{sech}^{\nu}(c z) \left(e^{2cz}(\nu+2)\, {}_2F_1\!\left(\nu+3, \nu+1; \nu+4; -e^{2cz}\right) - (\nu+3)\, {}_2F_1\!\left(\nu+2, \nu+1; \nu+3; -e^{2cz}\right)\right)$$

## Involving powers of tanh and exp

### Involving $e^{p z} \tanh^{\mu}(c z) \operatorname{sech}^{\nu}(c z)$

01.24.21.0510.01

$$\int e^{p z} \tanh^{\mu}(c z) \operatorname{sech}^{\nu}(c z)\, dz = \frac{1}{p - c\nu} \left(e^{p z}\left(1 - e^{-2cz}\right)^{-\mu}\left(1 + e^{-2cz}\right)^{\mu+\nu} F_1\!\left(-\frac{p - c\nu}{2c}; \mu+\nu, -\mu; \frac{1}{2}\left(-\frac{p}{c} + \nu + 2\right); -e^{-2cz}, e^{-2cz}\right) \operatorname{sech}^{\nu}(c z) \tanh^{\mu}(c z)\right)$$

01.24.21.0511.01

$$\int e^{c\nu z} \tanh^{\mu}(c z) \operatorname{sech}^{\nu}(c z)\, dz = \frac{e^{cz\nu}\left(1 - e^{2cz}\right)^{-\mu}\left(1 + e^{2cz}\right)^{\mu+\nu} \operatorname{sech}^{\nu}(c z) \tanh^{\mu}(c z)}{2c\nu} F_1\!\left(\nu; -\mu, \mu+\nu; \nu+1; e^{2cz}, -e^{2cz}\right)$$

## Involving coth and exp

### Involving $e^{p z} \coth(c z) \operatorname{sech}^{\nu}(c z)$

01.24.21.0512.01

$$\int e^{pz} \coth(cz) \operatorname{sech}^{\nu}(cz)\, dz = \frac{e^{pz} \left(1 + e^{-2cz}\right)^{\nu} \operatorname{sech}^{\nu}(cz)}{p - c\nu} F_1\left(-\frac{p - c\nu}{2c}; \nu - 1, 1; \frac{1}{2}\left(-\frac{p}{c} + \nu + 2\right); -e^{-2cz}, e^{-2cz}\right)$$

01.24.21.0513.01

$$\int e^{c\nu z} \coth(cz) \operatorname{sech}^{\nu}(cz)\, dz = -\frac{e^{cz\nu} \left(1 + e^{2cz}\right)^{\nu} \operatorname{sech}^{\nu}(cz)}{2c\nu} F_1\left(\nu; \nu - 1, 1; \nu + 1; -e^{2cz}, e^{2cz}\right)$$

Involving powers of coth and exp

## Involving $e^{pz} \coth^{\mu}(cz) \operatorname{sech}^{\nu}(cz)$

01.24.21.0514.01

$$\int e^{pz} \coth^{\mu}(cz) \operatorname{sech}^{\nu}(cz)\, dz =$$

$$\frac{e^{pz} \left(1 - e^{-2cz}\right)^{\mu} \left(1 + e^{-2cz}\right)^{\nu-\mu} \coth^{\mu}(cz) \operatorname{sech}^{\nu}(cz)}{p - c\nu} F_1\left(-\frac{p - c\nu}{2c}; \nu - \mu, \mu; \frac{1}{2}\left(-\frac{p}{c} + \nu + 2\right); -e^{-2cz}, e^{-2cz}\right)$$

01.24.21.0515.01

$$\int e^{c\nu z} \coth^{\mu}(cz) \operatorname{sech}^{\nu}(cz)\, dz = \frac{e^{cz\nu} \left(1 - e^{2cz}\right)^{\mu} \left(1 + e^{2cz}\right)^{\nu-\mu} \coth^{\mu}(cz) \operatorname{sech}^{\nu}(cz)}{2c\nu} F_1\left(\nu; \mu, \nu - \mu; \nu + 1; e^{2cz}, -e^{2cz}\right)$$

Involving csch and exp

## Involving $e^{pz} \operatorname{csch}(cz) \operatorname{sech}^{\nu}(cz)$

01.24.21.0516.01

$$\int e^{pz} \operatorname{csch}(cz) \operatorname{sech}^{\nu}(cz)\, dz =$$

$$\frac{e^{pz} \left(1 - e^{-2cz}\right) \left(1 + e^{-2cz}\right)^{\nu} \operatorname{csch}(cz) \operatorname{sech}^{\nu}(cz)}{p - c(\nu + 1)} F_1\left(\frac{\nu c + c - p}{2c}; \nu, 1; \frac{c(\nu + 3) - p}{2c}; -e^{-2cz}, e^{-2cz}\right)$$

01.24.21.0517.01

$$\int e^{pz} \operatorname{csch}(cz) \operatorname{sech}^{\nu}(cz)\, dz =$$

$$\frac{e^{pz} \left(1 - e^{-2cz}\right) \left(1 + e^{-2cz}\right)^{\nu} \operatorname{csch}(cz) \operatorname{sech}^{\nu}(cz)}{p - c(\nu + 1)} F_1\left(\frac{\nu c + c - p}{2c}; \nu, 1; \frac{c(\nu + 3) - p}{2c}; -e^{-2cz}, e^{-2cz}\right)$$

01.24.21.0518.01

$$\int e^{c(\nu+1)z} \operatorname{csch}(cz) \operatorname{sech}^{\nu}(cz)\, dz = -\frac{e^{cz(\nu+2)} \left(1 + e^{2cz}\right)^{\nu} \operatorname{sech}^{\nu}(cz)}{c(\nu + 1)} F_1\left(\nu + 1; 1, \nu; \nu + 2; e^{2cz}, -e^{2cz}\right)$$

Involving powers of csch and exp

## Involving $e^{pz} \operatorname{csch}^{\mu}(cz) \operatorname{sech}^{\nu}(cz)$

01.24.21.0519.01

$$\int e^{p z} \operatorname{csch}^{\mu}(c z) \operatorname{sech}^{\nu}(c z)\, dz = \frac{e^{p z} \left(1 - e^{-2 c z}\right)^{\mu} \left(1 + e^{-2 c z}\right)^{\nu} \operatorname{csch}^{\mu}(c z) \operatorname{sech}^{\nu}(c z)}{p - c(\mu + \nu)} F_1\left(\frac{c(\mu + \nu) - p}{2 c}; \nu, \mu; \frac{c(\mu + \nu + 2) - p}{2 c}; -e^{-2 c z}, e^{-2 c z}\right)$$

01.24.21.0520.01

$$\int e^{c(\mu+\nu) z} \operatorname{csch}^{\mu}(c z) \operatorname{sech}^{\nu}(c z)\, dz = \frac{e^{c z(\mu+\nu)} \left(1 - e^{2 c z}\right)^{\mu} \left(1 + e^{2 c z}\right)^{\nu} \operatorname{csch}^{\mu}(c z) \operatorname{sech}^{\nu}(c z)}{2 c(\mu + \nu)} F_1\left(\mu + \nu; \mu, \nu; \mu + \nu + 1; e^{2 c z}, -e^{2 c z}\right)$$

**Involving functions of the direct function, hyperbolic and trigonometric functions**

## Involving powers of the direct function, hyperbolic and trigonometric functions

### Involving sin and sinh

### Involving $\sin(a z) \sinh(b z) \operatorname{sech}^{\nu}(c z)$

01.24.21.0521.01

$$\int \sin(a z) \sinh(b z) \operatorname{sech}^{\nu}(c z)\, dz = \frac{1}{4} \left(1 + e^{2 c z}\right)^{\nu} \operatorname{sech}^{\nu}(c z) \left(\frac{e^{-\frac{1}{2}(i \pi) + (b + i a) z} {}_2F_1\left(\frac{b}{2 c} + \frac{i a}{2 c} + \frac{\nu}{2}, \nu; \frac{b}{2 c} + \frac{i a}{2 c} + \frac{\nu}{2} + 1; -e^{2 c z}\right)}{b + i a + c \nu} - \frac{e^{-\frac{1}{2}(i \pi) + (b - i a) z} {}_2F_1\left(\frac{b}{2 c} + \frac{\nu}{2} - \frac{i a}{2 c}, \nu; \frac{b}{2 c} + \frac{\nu}{2} - \frac{i a}{2 c} + 1; -e^{2 c z}\right)}{b - i a + c \nu} + \frac{e^{\frac{i \pi}{2} + (i a - b) z} {}_2F_1\left(-\frac{b}{2 c} + \frac{i a}{2 c} + \frac{\nu}{2}, \nu; -\frac{b}{2 c} + \frac{i a}{2 c} + \frac{\nu}{2} + 1; -e^{2 c z}\right)}{-b + i a + c \nu} - \frac{e^{\frac{i \pi}{2} + (-b - i a) z} {}_2F_1\left(-\frac{b}{2 c} + \frac{\nu}{2} - \frac{i a}{2 c}, \nu; -\frac{b}{2 c} + \frac{\nu}{2} - \frac{i a}{2 c} + 1; -e^{2 c z}\right)}{-b - i a + c \nu}\right)$$

### Involving powers of sin and powers of sinh

### Involving $\sin^{m}(a z) \sinh^{u}(b z) \operatorname{sech}^{\nu}(c z)$

01.24.21.0522.01

$$\int \sin^m(a z)\sinh^u(b z)\operatorname{sech}^\nu(c z)\,dz = \frac{i^u\, 2^{-m-u}\left(1+e^{2cz}\right)^\nu (1-m \bmod 2)(1-u \bmod 2)\operatorname{sech}^\nu(cz)}{c\,\nu}\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}\,{}_2F_1\!\left(\frac{\nu}{2},\nu;\frac{\nu}{2}+1;-e^{2cz}\right)+\left(\frac{i}{2}\right)^{m+u}\left(1+e^{2cz}\right)^\nu\binom{u}{\frac{u}{2}}$$

$$(1-u \bmod 2)\operatorname{sech}^\nu(cz)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(\frac{(-1)^m e^{i a (m-2k) z}\,{}_2F_1\!\left(-\frac{iak}{c}+\frac{iam}{2c}+\frac{\nu}{2},\nu;-\frac{iak}{c}+\frac{iam}{2c}+\frac{\nu}{2}+1;-e^{2cz}\right)}{a\,i\,(m-2k)+c\,\nu}+\right.$$

$$\left.\frac{e^{-i a (m-2k) z}\,{}_2F_1\!\left(\frac{iak}{c}+\frac{\nu}{2}-\frac{iam}{2c},\nu;\frac{iak}{c}+\frac{\nu}{2}-\frac{iam}{2c}+1;-e^{2cz}\right)}{a\,i\,(2k-m)+c\,\nu}\right)+2^{-m-u}\left(1+e^{2cz}\right)^\nu\binom{m}{\frac{m}{2}}$$

$$(1-m \bmod 2)\operatorname{sech}^\nu(cz)\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}\left(\frac{e^{b(u-2s)z}\,{}_2F_1\!\left(-\frac{bs}{c}+\frac{bu}{2c}+\frac{\nu}{2},\nu;-\frac{bs}{c}+\frac{bu}{2c}+\frac{\nu}{2}+1;-e^{2cz}\right)}{b\,(u-2s)+c\,\nu}+\right.$$

$$\left.\frac{(-1)^u e^{-b(u-2s)z}\,{}_2F_1\!\left(\frac{bs}{c}+\frac{\nu}{2}-\frac{bu}{2c},\nu;\frac{bs}{c}+\frac{\nu}{2}-\frac{bu}{2c}+1;-e^{2cz}\right)}{c\,\nu-b\,(u-2s)}\right)+$$

$$2^{-m-u}\left(1+e^{2cz}\right)^\nu\operatorname{sech}^\nu(cz)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}\left(\left(e^{(a\,i\,(m-2k)+b\,(u-2s))z-\frac{i m \pi}{2}}\,{}_2F_1\!\left(-\frac{iak}{c}+\frac{iam}{2c}+\frac{bu}{2c}+\right.\right.\right.$$

$$\left.\left.\frac{\nu}{2}-\frac{bs}{c},\nu;-\frac{iak}{c}+\frac{iam}{2c}+\frac{bu}{2c}+\frac{\nu}{2}-\frac{bs}{c}+1;-e^{2cz}\right)\right)\Big/\left(a\,i\,(m-2k)+b\,(u-2s)+c\,\nu\right)+$$

$$\left(e^{\frac{i\pi m}{2}+(b\,(u-2s)-i\,a\,(m-2k))z}\,{}_2F_1\!\left(\frac{iak}{c}+\frac{bu}{2c}+\frac{\nu}{2}-\frac{bs}{c}-\frac{iam}{2c},\nu;\frac{iak}{c}+\frac{bu}{2c}+\frac{\nu}{2}-\frac{bs}{c}-\frac{iam}{2c}+1;-e^{2cz}\right)\right)\Big/$$

$$\left(-i\,a\,(m-2k)+b\,(u-2s)+c\,\nu\right)+\left((-1)^u e^{(i\,a\,(m-2k)-b\,(u-2s))z-\frac{i m \pi}{2}}\,{}_2F_1\!\left(-\frac{iak}{c}+\frac{iam}{2c}+\frac{bs}{c}+\frac{\nu}{2}-\right.\right.$$

$$\left.\left.\frac{bu}{2c},\nu;-\frac{iak}{c}+\frac{iam}{2c}+\frac{bs}{c}+\frac{\nu}{2}-\frac{bu}{2c}+1;-e^{2cz}\right)\right)\Big/\left(a\,i\,(m-2k)-b\,(u-2s)+c\,\nu\right)+$$

$$\left((-1)^u e^{\frac{i\pi m}{2}+(-i\,a\,(m-2k)-b\,(u-2s))z}\,{}_2F_1\!\left(\frac{iak}{c}+\frac{bs}{c}+\frac{\nu}{2}-\frac{iam}{2c}-\frac{bu}{2c},\nu;\frac{iak}{c}+\frac{bs}{c}+\frac{\nu}{2}-\right.\right.$$

$$\left.\left.\left.\frac{iam}{2c}-\frac{bu}{2c}+1;-e^{2cz}\right)\right)\Big/\left(-i\,a\,(m-2k)-b\,(u-2s)+c\,\nu\right)\right)\;/;\;m\in\mathbb{N}^+\bigwedge u\in\mathbb{N}^+$$

01.24.21.0523.01

$$\int \sin^m(a z)\sinh^\mu(c z)\operatorname{sech}^\nu(c z)\,dz = 2^{-m}\left(1-e^{-2cz}\right)^{-\mu}\left(1+e^{-2cz}\right)^{\nu}\operatorname{sech}^\nu(c z)\sinh^\mu(c z)\left(e^{-\frac{1}{2}i m\pi}\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(\frac{(-1)^m e^{i a(2k-m)z}}{c(\mu-\nu)-i a(m-2k)}F_1\left(-\frac{-i a(m-2k)+c\mu-c\nu}{2c};\nu,-\mu;\frac{a i(m-2k)+c(-\mu+\nu+2)}{2c};-e^{-2cz},e^{-2cz}\right)+\frac{e^{i a(m-2k)z}}{a i(m-2k)+c(\mu-\nu)}F_1\left(-\frac{a i(m-2k)+c\mu-c\nu}{2c};\nu,-\mu;-\frac{a i(m-2k)+c(\mu-\nu-2)}{2c};-e^{-2cz},e^{-2cz}\right)\right)-\frac{m \bmod 2-1}{c(\mu-\nu)}F_1\left(-\frac{c\mu-c\nu}{2c};\nu,-\mu;\frac{1}{2}(-\mu+\nu+2);-e^{-2cz},e^{-2cz}\right)\binom{m}{\frac{m}{2}}\right)\;/;\;m\in\mathbb{N}^+$$

Involving cos and sinh

## Involving $\cos(a z)\sinh(b z)\operatorname{sech}^\nu(c z)$

01.24.21.0524.01

$$\int \cos(a z)\sinh(b z)\operatorname{sech}^\nu(c z)\,dz = \frac{1}{4}i\left(1+e^{2cz}\right)^\nu\operatorname{sech}^\nu(c z)\left(\frac{e^{-\frac{1}{2}(i\pi)+(b+i a)z}\,{}_2F_1\left(\frac{b}{2c}+\frac{i a}{2c}+\frac{\nu}{2},\nu;\frac{b}{2c}+\frac{i a}{2c}+\frac{\nu}{2}+1;-e^{2cz}\right)}{b+i a+c\nu}+\frac{e^{-\frac{1}{2}(i\pi)+(b-i a)z}\,{}_2F_1\left(\frac{b}{2c}+\frac{\nu}{2}-\frac{i a}{2c},\nu;\frac{b}{2c}+\frac{\nu}{2}-\frac{i a}{2c}+1;-e^{2cz}\right)}{b-i a+c\nu}+\frac{e^{\frac{i\pi}{2}+(i a-b)z}\,{}_2F_1\left(-\frac{b}{2c}+\frac{i a}{2c}+\frac{\nu}{2},\nu;-\frac{b}{2c}+\frac{i a}{2c}+\frac{\nu}{2}+1;-e^{2cz}\right)}{-b+i a+c\nu}+\frac{e^{\frac{i\pi}{2}+(-b-i a)z}\,{}_2F_1\left(-\frac{b}{2c}+\frac{\nu}{2}-\frac{i a}{2c},\nu;-\frac{b}{2c}+\frac{\nu}{2}-\frac{i a}{2c}+1;-e^{2cz}\right)}{-b-i a+c\nu}\right)$$

Involving powers of cos and powers of sinh

## Involving $\cos^m(a z)\sinh^u(b z)\operatorname{sech}^\nu(c z)$

01.24.21.0525.01

$$\int \cos^m(a z)\sinh^u(b z)\operatorname{sech}^\nu(c z)\,dz = \frac{1}{c\nu}\Bigg(i^u\,2^{-m-u}\left(1+e^{2cz}\right)^\nu\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}\,{}_2F_1\!\left(\frac{\nu}{2},\nu;\frac{\nu}{2}+1;-e^{2cz}\right)(1-m\bmod 2)\,(1-u\bmod 2)\operatorname{sech}^\nu(c z)\Bigg) - i^u\,2^{-m-u}\left(1+e^{2cz}\right)^\nu \binom{u}{\frac{u}{2}}(u\bmod 2-1)\operatorname{sech}^\nu(c z)\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\Bigg(\frac{e^{-i a(m-2s)z}\,{}_2F_1\!\left(-\frac{i a m}{2c}+\frac{i a s}{c}+\frac{\nu}{2},\nu;-\frac{i a m}{2c}+\frac{i a s}{c}+\frac{\nu}{2}+1;-e^{2cz}\right)}{c\nu-i a(m-2s)} + \frac{e^{i a(m-2s)z}\,{}_2F_1\!\left(\frac{i a m}{2c}+\frac{\nu}{2}-\frac{i a s}{c},\nu;\frac{i a m}{2c}+\frac{\nu}{2}-\frac{i a s}{c}+1;-e^{2cz}\right)}{a i(m-2s)+c\nu}\Bigg) + i^u\,2^{-m-u}\left(1+e^{2cz}\right)^\nu\binom{m}{\frac{m}{2}}(1-m\bmod 2)\operatorname{sech}^\nu(c z)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\Bigg(\frac{e^{b(u-2k)z-\frac{i\pi u}{2}}\,{}_2F_1\!\left(-\frac{b k}{c}+\frac{b u}{2c}+\frac{\nu}{2},\nu;-\frac{b k}{c}+\frac{b u}{2c}+\frac{\nu}{2}+1;-e^{2cz}\right)}{b(u-2k)+c\nu} + \frac{e^{\frac{i\pi u}{2}-b(u-2k)z}\,{}_2F_1\!\left(\frac{b k}{c}+\frac{\nu}{2}-\frac{b u}{2c},\nu;\frac{b k}{c}+\frac{\nu}{2}-\frac{b u}{2c}+1;-e^{2cz}\right)}{c\nu-b(u-2k)}\Bigg) +$$

$$i^u\,2^{-m-u}\left(1+e^{2cz}\right)^\nu\operatorname{sech}^\nu(c z)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{s}\binom{u}{k}\Bigg(\Bigg(e^{(b(u-2k)-i a(m-2s))z-\frac{i\pi u}{2}}\,{}_2F_1\!\left(-\frac{b k}{c}+\frac{i a s}{c}+\frac{b u}{2c}+\frac{\nu}{2}-\frac{i a m}{2c},\nu;-\frac{b k}{c}+\frac{i a s}{c}+\frac{b u}{2c}+\frac{\nu}{2}-\frac{i a m}{2c}+1;-e^{2cz}\right)\Bigg)\Big/(-i a(m-2s)+b(u-2k)+c\nu) + \Bigg(e^{(a i(m-2s)+b(u-2k))z-\frac{i\pi u}{2}}\,{}_2F_1\!\left(-\frac{b k}{c}+\frac{i a m}{2c}+\frac{b u}{2c}+\frac{\nu}{2}-\frac{i a s}{c},\nu;-\frac{b k}{c}+\frac{i a m}{2c}+\frac{b u}{2c}+\frac{\nu}{2}-\frac{i a s}{c}+1;-e^{2cz}\right)\Bigg)\Big/(a i(m-2s)+b(u-2k)+c\nu) + \Bigg(e^{\frac{i\pi u}{2}+(-i a(m-2s)-b(u-2k))z}\,{}_2F_1\!\left(\frac{b k}{c}+\frac{i a s}{c}+\frac{\nu}{2}-\frac{i a m}{2c}-\frac{b u}{2c},\nu;\frac{b k}{c}+\frac{i a s}{c}+\frac{\nu}{2}-\frac{i a m}{2c}-\frac{b u}{2c}+1;-e^{2cz}\right)\Bigg)\Big/(-i a(m-2s)-b(u-2k)+c\nu) + \Bigg(e^{\frac{i\pi u}{2}+(i a(m-2s)-b(u-2k))z}\,{}_2F_1\!\left(\frac{b k}{c}+\frac{i a m}{2c}+\frac{\nu}{2}-\frac{i a s}{c}-\frac{b u}{2c},\nu;\frac{b k}{c}+\frac{i a m}{2c}+\frac{\nu}{2}-\frac{i a s}{c}-\frac{b u}{2c}+1;-e^{2cz}\right)\Bigg)\Big/(a i(m-2s)-b(u-2k)+c\nu)\Bigg)\;/;\; m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

01.24.21.0526.01

$$\int \cos^m(a z) \sinh^\mu(c z) \operatorname{sech}^\nu(c z) \, dz = 2^{-m} \left(1 + e^{-2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \sinh^\mu(c z) \left(1 - e^{-2 c z}\right)^{-\mu}$$
$$\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left( \frac{e^{-i a (m-2k) z} F_1\left(-\frac{-i a (m-2k) + c \mu - c \nu}{2c}; \nu, -\mu; \frac{a i (m-2k) + c(-\mu+\nu+2)}{2c}; -e^{-2 c z}, e^{-2 c z}\right)}{c(\mu - \nu) - i a (m - 2k)} + \right.$$
$$\left. \frac{e^{i a (m-2k) z} F_1\left(-\frac{a i (m-2k) + c \mu - c \nu}{2c}; \nu, -\mu; \frac{c(-\mu+\nu+2) - i a (m-2k)}{2c}; -e^{-2 c z}, e^{-2 c z}\right)}{a i (m-2k) + c(\mu - \nu)} \right) +$$
$$\frac{1}{c(\mu - \nu)} 2^{-m} \left(1 - e^{-2 c z}\right)^{-\mu} \left(1 + e^{-2 c z}\right)^\nu F_1\left(-\frac{c \mu - c \nu}{2c}; \nu, -\mu; \frac{1}{2}(-\mu + \nu + 2); -e^{-2 c z}, e^{-2 c z}\right)$$
$$\binom{m}{\frac{m}{2}} (1 - m \bmod 2) \operatorname{sech}^\nu(c z) \sinh^\mu(c z) \;/;\; m \in \mathbb{N}^+$$

## Involving sin and cosh

### Involving $\sin(a z) \cosh(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0527.01

$$\int \sin(a z) \cosh(b z) \operatorname{sech}^\nu(c z) \, dz = \frac{1}{4} \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \left( \frac{e^{-\frac{1}{2}(i \pi) + (b + i a) z} \, {}_2F_1\left(\frac{b}{2c} + \frac{i a}{2c} + \frac{\nu}{2}, \nu; \frac{b}{2c} + \frac{i a}{2c} + \frac{\nu}{2} + 1; -e^{2 c z}\right)}{b + i a + c \nu} - \right.$$
$$\frac{e^{-\frac{1}{2}(i \pi) + (b - i a) z} \, {}_2F_1\left(\frac{b}{2c} + \frac{\nu}{2} - \frac{i a}{2c}, \nu; \frac{b}{2c} + \frac{\nu}{2} - \frac{i a}{2c} + 1; -e^{2 c z}\right)}{b - i a + c \nu} -$$
$$\frac{e^{\frac{i \pi}{2} + (i a - b) z} \, {}_2F_1\left(-\frac{b}{2c} + \frac{i a}{2c} + \frac{\nu}{2}, \nu; -\frac{b}{2c} + \frac{i a}{2c} + \frac{\nu}{2} + 1; -e^{2 c z}\right)}{-b + i a + c \nu} +$$
$$\left. \frac{e^{\frac{i \pi}{2} + (-b - i a) z} \, {}_2F_1\left(-\frac{b}{2c} + \frac{\nu}{2} - \frac{i a}{2c}, \nu; -\frac{b}{2c} + \frac{\nu}{2} - \frac{i a}{2c} + 1; -e^{2 c z}\right)}{-b - i a + c \nu} \right)$$

## Involving powers of sin and powers of cosh

### Involving $\sin^m(a z) \cosh^u(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0528.01

$$\int \sin^m(a z)\cosh^u(b z)\operatorname{sech}^\nu(c z)\,dz == 2^{-m-u}\left(1+e^{2cz}\right)^\nu \binom{u}{\frac{u}{2}}(1-u \bmod 2)\operatorname{sech}^\nu(c z)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(\frac{e^{i a(m-2k)z-\frac{i m\pi}{2}}\,{}_2F_1\left(-\frac{i a k}{c}+\frac{i a m}{2c}+\frac{\nu}{2},\nu;-\frac{i a k}{c}+\frac{i a m}{2c}+\frac{\nu}{2}+1;-e^{2cz}\right)}{a i(m-2k)+c\nu}+\frac{e^{\frac{i m\pi}{2}-i a(m-2k)z}\,{}_2F_1\left(\frac{i a k}{c}+\frac{\nu}{2}-\frac{i a m}{2c},\nu;\frac{i a k}{c}+\frac{\nu}{2}-\frac{i a m}{2c}+1;-e^{2cz}\right)}{c\nu-i a(m-2k)}\right)-$$

$$2^{-m-u}\left(1+e^{2cz}\right)^\nu\binom{m}{\frac{m}{2}}(m \bmod 2-1)\operatorname{sech}^\nu(c z)\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(\frac{e^{b(u-2s)z}\,{}_2F_1\left(-\frac{b s}{c}+\frac{b u}{2c}+\frac{\nu}{2},\nu;-\frac{b s}{c}+\frac{b u}{2c}+\frac{\nu}{2}+1;-e^{2cz}\right)}{b(u-2s)+c\nu}+\frac{e^{-b(u-2s)z}\,{}_2F_1\left(\frac{b s}{c}+\frac{\nu}{2}-\frac{b u}{2c},\nu;\frac{b s}{c}+\frac{\nu}{2}-\frac{b u}{2c}+1;-e^{2cz}\right)}{c\nu-b(u-2s)}\right)+$$

$$2^{-m-u}\left(1+e^{2cz}\right)^\nu\operatorname{sech}^\nu(c z)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\binom{u}{s}\Bigg(\left(e^{(a i(m-2k)+b(u-2s))z-\frac{i m\pi}{2}}\,{}_2F_1\left(-\frac{i a k}{c}+\frac{i a m}{2c}+\frac{b u}{2c}+\frac{\nu}{2}-\frac{b s}{c},\nu;-\frac{i a k}{c}+\frac{i a m}{2c}+\frac{b u}{2c}+\frac{\nu}{2}-\frac{b s}{c}+1;-e^{2cz}\right)\right)\Big/(a i(m-2k)+b(u-2s)+c\nu)+$$

$$\left(e^{\frac{i\pi m}{2}+(b(u-2s)-i a(m-2k))z}\,{}_2F_1\left(\frac{i a k}{c}+\frac{b u}{2c}+\frac{\nu}{2}-\frac{b s}{c}-\frac{i a m}{2c},\nu;\frac{i a k}{c}+\frac{b u}{2c}+\frac{\nu}{2}-\frac{b s}{c}-\frac{i a m}{2c}+1;-e^{2cz}\right)\right)\Big/(-i a(m-2k)+b(u-2s)+c\nu)+$$

$$\left(e^{(i a(m-2k)-b(u-2s))z-\frac{i m\pi}{2}}\,{}_2F_1\left(-\frac{i a k}{c}+\frac{i a m}{2c}+\frac{b s}{c}+\frac{\nu}{2}-\frac{b u}{2c},\nu;-\frac{i a k}{c}+\frac{i a m}{2c}+\frac{b s}{c}+\frac{\nu}{2}-\frac{b u}{2c}+1;-e^{2cz}\right)\right)\Big/(a i(m-2k)-b(u-2s)+c\nu)+$$

$$\left(e^{\frac{i\pi m}{2}+(-i a(m-2k)-b(u-2s))z}\,{}_2F_1\left(\frac{i a k}{c}+\frac{b s}{c}+\frac{\nu}{2}-\frac{i a m}{2c}-\frac{b u}{2c},\nu;\frac{i a k}{c}+\frac{b s}{c}+\frac{\nu}{2}-\frac{i a m}{2c}-\frac{b u}{2c}+1;-e^{2cz}\right)\right)\Big/(-i a(m-2k)-b(u-2s)+c\nu)\Bigg)+$$

$$\frac{2^{-m-u}\left(1+e^{2cz}\right)^\nu(1-m \bmod 2)(1-u \bmod 2)\operatorname{sech}^\nu(c z)}{c\nu}\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}\,{}_2F_1\left(\frac{\nu}{2},\nu;\frac{\nu}{2}+1;-e^{2cz}\right)\ /;\ m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

## Involving cos and cosh

### Involving $\cos(a z)\cosh(b z)\operatorname{sech}^\nu(c z)$

01.24.21.0529.01

$$\int \cos(a\,z)\cosh(b\,z)\operatorname{sech}^{\nu}(c\,z)\,dz = \frac{1}{4}\,i\left(1+e^{2cz}\right)^{\nu}\operatorname{sech}^{\nu}(c\,z)\left(\frac{e^{-\frac{1}{2}(i\pi)+(b+ia)z}\,{}_2F_1\left(\frac{b}{2c}+\frac{ia}{2c}+\frac{\nu}{2},\nu;\frac{b}{2c}+\frac{ia}{2c}+\frac{\nu}{2}+1;-e^{2cz}\right)}{b+ia+c\nu}+\right.$$

$$\frac{e^{-\frac{1}{2}(i\pi)+(b-ia)z}\,{}_2F_1\left(\frac{b}{2c}+\frac{\nu}{2}-\frac{ia}{2c},\nu;\frac{b}{2c}+\frac{\nu}{2}-\frac{ia}{2c}+1;-e^{2cz}\right)}{b-ia+c\nu}-$$

$$\frac{e^{\frac{i\pi}{2}+(ia-b)z}\,{}_2F_1\left(-\frac{b}{2c}+\frac{ia}{2c}+\frac{\nu}{2},\nu;-\frac{b}{2c}+\frac{ia}{2c}+\frac{\nu}{2}+1;-e^{2cz}\right)}{-b+ia+c\nu}-$$

$$\left.\frac{e^{\frac{i\pi}{2}+(-b-ia)z}\,{}_2F_1\left(-\frac{b}{2c}+\frac{\nu}{2}-\frac{ia}{2c},\nu;-\frac{b}{2c}+\frac{\nu}{2}-\frac{ia}{2c}+1;-e^{2cz}\right)}{-b-ia+c\nu}\right)$$

## Involving powers of cos and powers of cosh

### Involving $\cos^m(a\,z)\cosh^u(b\,z)\operatorname{sech}^{\nu}(c\,z)$

01.24.21.0530.01

$$\int \cos^m(a z)\cosh^u(b z)\operatorname{sech}^\nu(c z)\,dz = -2^{-m-u}\left(1+e^{2cz}\right)^\nu \binom{u}{\frac{u}{2}}(u \bmod 2-1)\left(\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(\frac{e^{-i a(m-2s)z}\,{}_2F_1\left(-\frac{i a m}{2c}+\frac{i a s}{c}+\frac{\nu}{2},\nu;-\frac{i a m}{2c}+\frac{i a s}{c}+\frac{\nu}{2}+1;-e^{2cz}\right)}{c\nu-i a(m-2s)}+\frac{e^{i a(m-2s)z}\,{}_2F_1\left(\frac{i a m}{2c}+\frac{\nu}{2}-\frac{i a s}{c},\nu;\frac{i a m}{2c}+\frac{\nu}{2}-\frac{i a s}{c}+1;-e^{2cz}\right)}{a i(m-2s)+c\nu}\right)\right)\operatorname{sech}^\nu(c z)+$$

$$2^{-m-u}\left(1+e^{2cz}\right)^\nu\binom{m}{\frac{m}{2}}(1-m \bmod 2)\left(\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(\frac{e^{b(u-2s)z}\,{}_2F_1\left(-\frac{b s}{c}+\frac{b u}{2c}+\frac{\nu}{2},\nu;-\frac{b s}{c}+\frac{b u}{2c}+\frac{\nu}{2}+1;-e^{2cz}\right)}{b(u-2s)+c\nu}+\frac{e^{-b(u-2s)z}\,{}_2F_1\left(\frac{b s}{c}+\frac{\nu}{2}-\frac{b u}{2c},\nu;\frac{b s}{c}+\frac{\nu}{2}-\frac{b u}{2c}+1;-e^{2cz}\right)}{c\nu-b(u-2s)}\right)\right)\operatorname{sech}^\nu(c z)+$$

$$2^{-m-u}\left(1+e^{2cz}\right)^\nu\left(\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\binom{u}{s}\left(\left(e^{(a i(m-2k)+b(u-2s))z}\,{}_2F_1\left(-\frac{i a k}{c}+\frac{i a m}{2c}+\frac{b u}{2c}+\frac{\nu}{2}-\frac{b s}{c},\nu;-\frac{i a k}{c}+\frac{i a m}{2c}+\frac{b u}{2c}+\frac{\nu}{2}-\frac{b s}{c}+1;-e^{2cz}\right)\right)\Big/(a i(m-2k)+b(u-2s)+c\nu)+\left(e^{(b(u-2s)-i a(m-2k))z}\,{}_2F_1\left(\frac{i a k}{c}+\frac{b u}{2c}+\frac{\nu}{2}-\frac{b s}{c}-\frac{i a m}{2c},\nu;\frac{i a k}{c}+\frac{b u}{2c}+\frac{\nu}{2}-\frac{b s}{c}-\frac{i a m}{2c}+1;-e^{2cz}\right)\right)\Big/(-i a(m-2k)+b(u-2s)+c\nu)+\left(e^{(i a(m-2k)-b(u-2s))z}\,{}_2F_1\left(-\frac{i a k}{c}+\frac{i a m}{2c}+\frac{b s}{c}+\frac{\nu}{2}-\frac{b u}{2c},\nu;-\frac{i a k}{c}+\frac{i a m}{2c}+\frac{b s}{c}+\frac{\nu}{2}-\frac{b u}{2c}+1;-e^{2cz}\right)\right)\Big/(a i(m-2k)-b(u-2s)+c\nu)+\left(e^{(-i a(m-2k)-b(u-2s))z}\,{}_2F_1\left(\frac{i a k}{c}+\frac{b s}{c}+\frac{\nu}{2}-\frac{i a m}{2c}-\frac{b u}{2c},\nu;\frac{i a k}{c}+\frac{b s}{c}+\frac{\nu}{2}-\frac{i a m}{2c}-\frac{b u}{2c}+1;-e^{2cz}\right)\right)\Big/(-i a(m-2k)-b(u-2s)+c\nu)\right)\right)$$

$$\operatorname{sech}^\nu(c z)+\frac{2^{-m-u}\left(1+e^{2cz}\right)^\nu(1-m \bmod 2)(1-u \bmod 2)\operatorname{sech}^\nu(c z)}{c\nu}$$

$$\binom{m}{\frac{m}{2}}$$

$$\binom{u}{\frac{u}{2}}$$

$${}_2F_1\left(\frac{\nu}{2},\nu;\frac{\nu}{2}+1;-e^{2cz}\right)\ /;\ m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

## Involving sin and tanh

### Involving $\sin(a z)\tanh(c z)\operatorname{sech}^{\nu}(c z)$

01.24.21.0531.01

$$\int \sin(a z)\tanh(c z)\operatorname{sech}^{\nu}(c z)\,dz = \frac{1}{4}\left(1+e^{2 c z}\right)^{\nu+1}\operatorname{sech}^{\nu+1}(c z)\left(-\frac{e^{-\frac{1}{2}(i\pi)+(i a-c) z}\,{}_2F_1\left(\frac{i a}{2 c}+\frac{\nu}{2},\nu+1;1+\frac{i a}{2 c}+\frac{\nu}{2};-e^{2 c z}\right)}{i a+c\nu}+\frac{e^{-\frac{1}{2}(i\pi)+(c+i a) z}\,{}_2F_1\left(1+\frac{i a}{2 c}+\frac{\nu}{2},\nu+1;2+\frac{i a}{2 c}+\frac{\nu}{2};-e^{2 c z}\right)}{i a+c(\nu+2)}-\frac{e^{\frac{i\pi}{2}+(-c-i a) z}\,{}_2F_1\left(-\frac{i a}{2 c}+\frac{\nu}{2},\nu+1;1-\frac{i a}{2 c}+\frac{\nu}{2};-e^{2 c z}\right)}{-i a+c\nu}+\frac{e^{\frac{i\pi}{2}+(c-i a) z}\,{}_2F_1\left(1-\frac{i a}{2 c}+\frac{\nu}{2},\nu+1;2-\frac{i a}{2 c}+\frac{\nu}{2};-e^{2 c z}\right)}{-i a+c(\nu+2)}\right)$$

## Involving powers of sin and powers of tanh

### Involving $\sin^{m}(a z)\tanh^{\mu}(c z)\operatorname{sech}^{\nu}(c z)$

01.24.21.0532.01

$$\int \sin^{m}(a z)\tanh^{\mu}(c z)\operatorname{sech}^{\nu}(c z)\,dz = 2^{-m}\left(1-e^{-2 c z}\right)^{-\mu}\left(1+e^{-2 c z}\right)^{\mu+\nu}\operatorname{sech}^{\nu}(c z)\tanh^{\mu}(c z)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^{k}\binom{m}{k}\left(\frac{1}{-i a(m-2k)-c\nu}\left(e^{\frac{i m\pi}{2}-(i a(m-2k)) z}\,F_1\left(-\frac{-i a(m-2k)-c\nu}{2c};\mu+\nu,-\mu;\frac{1}{2}\left(-\frac{-i a(m-2k)}{c}+\nu+2\right);-e^{-2 c z},e^{-2 c z}\right)\right)+\frac{1}{i a(m-2k)-c\nu}\left(e^{(i a(m-2k)) z-\frac{i m\pi}{2}}\,F_1\left(-\frac{i a(m-2k)-c\nu}{2c};\mu+\nu,-\mu;\frac{1}{2}\left(-\frac{i a(m-2k)}{c}+\nu+2\right);-e^{-2 c z},e^{-2 c z}\right)\right)\right)-\frac{1}{c\nu}\left(2^{-m}\left(1-e^{-2 c z}\right)^{-\mu}\left(1+e^{-2 c z}\right)^{\mu+\nu}F_1\left(\frac{\nu}{2};\mu+\nu,-\mu;\frac{\nu+2}{2};-e^{-2 c z},e^{-2 c z}\right)\binom{m}{\frac{m}{2}}(1-m \bmod 2)\operatorname{sech}^{\nu}(c z)\tanh^{\mu}(c z)\right)\;/;\;m\in\mathbb{N}^{+}$$

01.24.21.0533.01

$$\int \sin^m(a z)\tanh^u(c z)\operatorname{sech}^\nu(c z)\,dz = \frac{1}{c(u+\nu)}\left(i^u\,2^{-m-u}\left(1+e^{2cz}\right)^{u+\nu}\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}\,{}_2F_1\!\left(\frac{u}{2}+\frac{\nu}{2},u+\nu;\frac{u}{2}+\frac{\nu}{2}+1;-e^{2cz}\right)(1-m\bmod 2)(1-u\bmod 2)\operatorname{sech}^{u+\nu}(c z)\right)+$$
$$\left(\frac{i}{2}\right)^{m+u}\left(1+e^{2cz}\right)^{u+\nu}\binom{u}{\frac{u}{2}}(1-u\bmod 2)\operatorname{sech}^{u+\nu}(c z)$$
$$\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(\left((-1)^m e^{i a(m-2k)z}\,{}_2F_1\!\left(-\frac{iak}{c}+\frac{iam}{2c}+\frac{u}{2}+\frac{\nu}{2},u+\nu;-\frac{iak}{c}+\frac{iam}{2c}+\frac{u}{2}+\frac{\nu}{2}+1;-e^{2cz}\right)\right)\Big/\right.$$
$$\left.(a i(m-2k)+c(u+\nu))+\frac{e^{-ia(m-2k)z}\,{}_2F_1\!\left(\frac{iak}{c}+\frac{u}{2}+\frac{\nu}{2}-\frac{iam}{2c},u+\nu;\frac{iak}{c}+\frac{u}{2}+\frac{\nu}{2}-\frac{iam}{2c}+1;-e^{2cz}\right)}{a i(2k-m)+c(u+\nu)}\right)+$$
$$2^{-m-u}\left(1+e^{2cz}\right)^{u+\nu}\binom{m}{\frac{m}{2}}(1-m\bmod 2)\operatorname{sech}^{u+\nu}(c z)\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}$$
$$\left(\frac{(-1)^u e^{-c(u-2s)z}\,{}_2F_1\!\left(s+\frac{\nu}{2},u+\nu;s+\frac{\nu}{2}+1;-e^{2cz}\right)}{c(2s+\nu)}+\frac{e^{c(u-2s)z}\,{}_2F_1\!\left(-s+u+\frac{\nu}{2},u+\nu;-s+u+\frac{\nu}{2}+1;-e^{2cz}\right)}{c(-2s+2u+\nu)}\right)+$$
$$2^{-m-u}\left(1+e^{2cz}\right)^{u+\nu}\operatorname{sech}^{u+\nu}(c z)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}\left(\left((-1)^u e^{(ia(m-2k)-c(u-2s))z-\frac{im\pi}{2}}\,{}_2F_1\right.\right.$$
$$\left.\left(-\frac{iak}{c}+\frac{iam}{2c}+s+\frac{\nu}{2},u+\nu;-\frac{iak}{c}+\frac{iam}{2c}+s+\frac{\nu}{2}+1;-e^{2cz}\right)\right)\Big/(-2aik+iam+2cs+c\nu)+$$
$$\left((-1)^u e^{\frac{i\pi m}{2}+(-ia(m-2k)-c(u-2s))z}\,{}_2F_1\!\left(\frac{iak}{c}+s+\frac{\nu}{2}-\frac{iam}{2c},u+\nu;\frac{iak}{c}+s+\frac{\nu}{2}-\frac{iam}{2c}+1;-e^{2cz}\right)\right)\Big/$$
$$(2iak-iam+2cs+c\nu)+\left(e^{(ai(m-2k)+c(u-2s))z-\frac{im\pi}{2}}\,{}_2F_1\!\left(-\frac{iak}{c}+\frac{iam}{2c}-s+u+\frac{\nu}{2},u+\right.\right.$$
$$\left.\left.\nu;-\frac{iak}{c}+\frac{iam}{2c}-s+u+\frac{\nu}{2}+1;-e^{2cz}\right)\right)\Big/(a i(m-2k)+c(-2s+2u+\nu))+$$
$$\left(e^{\frac{i\pi m}{2}+(c(u-2s)-ia(m-2k))z}\,{}_2F_1\!\left(\frac{iak}{c}-s+u+\frac{\nu}{2}-\frac{iam}{2c},u+\nu;\frac{iak}{c}-s+u+\frac{\nu}{2}-\frac{iam}{2c}+1;-e^{2cz}\right)\right)\Big/$$
$$\left.(a i(2k-m)+c(-2s+2u+\nu))\right)\text{ /; } m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

## Involving cos and tanh

## Involving $\cos(a z)\tanh(c z)\operatorname{sech}^\nu(c z)$

01.24.21.0534.01

$$\int \cos(a z)\tanh(c z)\operatorname{sech}^{\nu}(c z)\,dz = \frac{1}{4}\left(1+e^{2cz}\right)^{\nu+1}\operatorname{sech}^{\nu+1}(c z)\left(-\frac{e^{(i a-c)z}\,{}_2F_1\left(\frac{i a}{2c}+\frac{\nu}{2},\nu+1;1+\frac{i a}{2c}+\frac{\nu}{2};-e^{2cz}\right)}{i a+c\nu}+\frac{e^{(c+i a)z}\,{}_2F_1\left(1+\frac{i a}{2c}+\frac{\nu}{2},\nu+1;2+\frac{i a}{2c}+\frac{\nu}{2};-e^{2cz}\right)}{i a+c(\nu+2)}-\frac{e^{(-c-i a)z}\,{}_2F_1\left(-\frac{i a}{2c}+\frac{\nu}{2},\nu+1;1-\frac{i a}{2c}+\frac{\nu}{2};-e^{2cz}\right)}{-i a+c\nu}+\frac{e^{(c-i a)z}\,{}_2F_1\left(1-\frac{i a}{2c}+\frac{\nu}{2},\nu+1;2-\frac{i a}{2c}+\frac{\nu}{2};-e^{2cz}\right)}{-i a+c(\nu+2)}\right)$$

## Involving powers of cos and powers of tanh

### Involving $\cos^{m}(a z)\tanh^{\mu}(c z)\operatorname{sech}^{\nu}(c z)$

01.24.21.0535.01

$$\int \cos^{m}(a z)\tanh^{\mu}(c z)\operatorname{sech}^{\nu}(c z)\,dz = 2^{-m}\left(1-e^{-2cz}\right)^{-\mu}\left(1+e^{-2cz}\right)^{\mu+\nu}\operatorname{sech}^{\nu}(c z)\tanh^{\mu}(c z)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\left(\frac{1}{-i a(m-2k)-c\nu}\left(e^{-i a(m-2k)z}F_1\left(-\frac{-i a(m-2k)-c\nu}{2c};\mu+\nu,-\mu;\frac{1}{2}\left(-\frac{-i a(m-2k)}{c}+\nu+2\right);-e^{-2cz},e^{-2cz}\right)\right)+\frac{1}{i a(m-2k)-c\nu}\left(e^{i a(m-2k)z}F_1\left(-\frac{i a(m-2k)-c\nu}{2c};\mu+\nu,-\mu;\frac{1}{2}\left(-\frac{i a(m-2k)}{c}+\nu+2\right);-e^{-2cz},e^{-2cz}\right)\right)\right)-\frac{1}{c\nu}\left(2^{-m}\left(1-e^{-2cz}\right)^{-\mu}\left(1+e^{-2cz}\right)^{\mu+\nu}F_1\left(\frac{\nu}{2};\mu+\nu,-\mu;\frac{\nu+2}{2};-e^{-2cz},e^{-2cz}\right)\binom{m}{\frac{m}{2}}(1-m\bmod 2)\operatorname{sech}^{\nu}(c z)\tanh^{\mu}(c z)\right)\;/;\;m\in\mathbb{N}^{+}$$

01.24.21.0536.01

$$\int \cos^m(a z) \tanh^u(c z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{c(u+\nu)} \left( i^u\, 2^{-m-u} \left(1+e^{2cz}\right)^{u+\nu} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} {}_2F_1\left(\frac{u}{2}+\frac{\nu}{2}, u+\nu; \frac{u}{2}+\frac{\nu}{2}+1; -e^{2cz}\right) (1 - m \bmod 2)(1 - u \bmod 2) \operatorname{sech}^{u+\nu}(c z)\right) -$$

$$i^u\, 2^{-m-u} \left(1+e^{2cz}\right)^{u+\nu} \binom{u}{\frac{u}{2}} (u \bmod 2 - 1) \operatorname{sech}^{u+\nu}(c z)$$

$$\sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \left( \left( e^{-i a (m-2s) z}\, {}_2F_1\left(-\frac{i a m}{2c} + \frac{i a s}{c} + \frac{u}{2} + \frac{\nu}{2}, u+\nu; -\frac{i a m}{2c} + \frac{i a s}{c} + \frac{u}{2} + \frac{\nu}{2} + 1; -e^{2cz}\right)\right) \Big/\right.$$

$$\left.(c(u+\nu) - i a (m-2s)) + \frac{e^{i a (m-2s) z}\, {}_2F_1\left(\frac{i a m}{2c} + \frac{u}{2} + \frac{\nu}{2} - \frac{i a s}{c}, u+\nu; \frac{i a m}{2c} + \frac{u}{2} + \frac{\nu}{2} - \frac{i a s}{c} + 1; -e^{2cz}\right)}{a\, i (m-2s) + c(u+\nu)}\right) +$$

$$2^{-m-u} \left(1+e^{2cz}\right)^{u+\nu} \binom{m}{\frac{m}{2}} (1 - m \bmod 2) \operatorname{sech}^{u+\nu}(c z) \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{u}{k}$$

$$\left( \frac{(-1)^u e^{-c(u-2k)z}\, {}_2F_1\left(k+\frac{\nu}{2}, u+\nu; k+\frac{\nu}{2}+1; -e^{2cz}\right)}{c(2k+\nu)} + \frac{e^{c(u-2k)z}\, {}_2F_1\left(-k+u+\frac{\nu}{2}, u+\nu; -k+u+\frac{\nu}{2}+1; -e^{2cz}\right)}{c(-2k+2u+\nu)} \right) +$$

$$2^{-m-u} \left(1+e^{2cz}\right)^{u+\nu} \operatorname{sech}^{u+\nu}(c z) \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{s} \binom{u}{k} \left( \left( (-1)^u e^{(-i a (m-2s) - c(u-2k)) z}\right.\right.$$

$$\left.\left. {}_2F_1\left(k+\frac{i a s}{c}+\frac{\nu}{2}-\frac{i a m}{2c}, u+\nu; k+\frac{i a s}{c}+\frac{\nu}{2}-\frac{i a m}{2c}+1; -e^{2cz}\right)\right)\right) \Big/ (c(2k+\nu) - i a (m-2s)) +$$

$$\left( (-1)^u e^{(i a (m-2s) - c(u-2k)) z}\, {}_2F_1\left(k+\frac{i a m}{2c}+\frac{\nu}{2}-\frac{i a s}{c}, u+\nu; k+\frac{i a m}{2c}+\frac{\nu}{2}-\frac{i a s}{c}+1; -e^{2cz}\right)\right) \Big/$$

$$(a\, i (m-2s) + c(2k+\nu)) + \left( e^{(c(u-2k) - i a (m-2s)) z}\, {}_2F_1\left(-k+\frac{i a s}{c}+u+\frac{\nu}{2}-\frac{i a m}{2c}, u+\nu;\right.\right.$$

$$\left.\left. -k+\frac{i a s}{c}+u+\frac{\nu}{2}-\frac{i a m}{2c}+1; -e^{2cz}\right)\right) \Big/ (c(-2k+2u+\nu) - i a (m-2s)) +$$

$$\left( e^{(a i (m-2s) + c(u-2k)) z}\, {}_2F_1\left(-k+\frac{i a m}{2c}+u+\frac{\nu}{2}-\frac{i a s}{c}, u+\nu; -k+\frac{i a m}{2c}+u+\frac{\nu}{2}-\frac{i a s}{c}+1; -e^{2cz}\right)\right) \Big/$$

$$\left.(a\, i (m-2s) + c(-2k+2u+\nu))\right) /; m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

## Involving sin and coth

## Involving $\sin(a z) \coth(c z) \operatorname{sech}^\nu(c z)$

01.24.21.0537.01

$$\int \sin(a z) \coth(c z) \operatorname{sech}^\nu(c z)\, dz = i\, e^{-cz} \left(1+e^{-2cz}\right)^{\nu-1} \left( -\frac{e^{-i a z}}{i a + c \nu} F_1\left(\frac{i a + c \nu}{2c}; \nu-1, 1; \frac{1}{2}\left(2+\frac{i a}{c}+\nu\right); -e^{-2cz}, e^{-2cz}\right) + \right.$$

$$\left.\frac{e^{i a z}}{-i a + c \nu} F_1\left(-\frac{i a - c \nu}{2c}; \nu-1, 1; \frac{1}{2}\left(2-\frac{i a}{c}+\nu\right); -e^{-2cz}, e^{-2cz}\right)\right) \operatorname{sech}^{\nu-1}(c z)$$

Involving powers of sin and powers of coth

## Involving $\sin^m(a z) \coth^\mu(c z) \operatorname{sech}^\nu(c z)$

01.24.21.0538.01

$$\int \sin^m(a z) \coth^\mu(c z) \operatorname{sech}^\nu(c z) \, dz = 2^{-m} \left(1 - e^{-2 c z}\right)^\mu \left(1 + e^{-2 c z}\right)^{\nu-\mu} \coth^\mu(c z) \operatorname{sech}^\nu(c z) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left( \frac{1}{-i a (m - 2 k) - c \nu} \left( e^{\frac{i m \pi}{2} - i a (m-2k) z} F_1\left(-\frac{-i a (m-2k) - c\nu}{2c}; \nu - \mu, \mu; \frac{1}{2}\left(\frac{a i (m - 2k)}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)\right) + \frac{1}{i a (m - 2k) - c \nu} \left( e^{i a (m-2k) z - \frac{i m \pi}{2}} F_1\left(-\frac{i a (m-2k) - c\nu}{2c}; \nu - \mu, \mu; \frac{1}{2}\left(-\frac{i a (m - 2k)}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)\right)\right) - \frac{1}{c \nu} \left(2^{-m} \left(1 - e^{-2 c z}\right)^\mu \left(1 + e^{-2 c z}\right)^{\nu-\mu} F_1\left(\frac{\nu}{2}; \nu - \mu, \mu; \frac{\nu+2}{2}; -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} \coth^\mu(c z) (1 - m \bmod 2) \operatorname{sech}^\nu(c z)\right) /; m \in \mathbb{N}^+$$

Involving cos and coth

## Involving $\cos(a z) \coth(c z) \operatorname{sech}^\nu(c z)$

01.24.21.0539.01

$$\int \cos(a z) \coth(c z) \operatorname{sech}^\nu(c z) \, dz = e^{-c z} \left(1 + e^{-2 c z}\right)^{\nu-1} \left( -\frac{e^{-i a z}}{i a + c \nu} F_1\left(\frac{i a + c \nu}{2 c}; \nu - 1, 1; \frac{1}{2}\left(2 + \frac{i a}{c} + \nu\right); -e^{-2 c z}, e^{-2 c z}\right) + \frac{e^{i a z}}{i a - c \nu} F_1\left(-\frac{i a - c \nu}{2 c}; \nu - 1, 1; \frac{1}{2}\left(2 - \frac{i a}{c} + \nu\right); -e^{-2 c z}, e^{-2 c z}\right)\right) \operatorname{sech}^{\nu-1}(c z)$$

Involving powers of cos and powers of coth

## Involving $\cos^m(a z) \coth^\mu(c z) \operatorname{sech}^\nu(c z)$

01.24.21.0540.01

$$\int \cos^m(a\,z)\coth^\mu(c\,z)\operatorname{sech}^\nu(c\,z)\,dz = 2^{-m}\left(1-e^{-2cz}\right)^\mu\left(1+e^{-2cz}\right)^{\nu-\mu}\coth^\mu(c\,z)\operatorname{sech}^\nu(c\,z)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\left(\frac{e^{-i a(m-2k)z}F_1\left(-\frac{-i a(m-2k)-c\nu}{2c};\nu-\mu,\mu;\frac{1}{2}\left(\frac{a\,i(m-2k)}{c}+\nu+2\right);-e^{-2cz},e^{-2cz}\right)}{-i\,a(m-2k)-c\,\nu}+\frac{e^{i a(m-2k)z}F_1\left(-\frac{i\,a(m-2k)-c\nu}{2c};\nu-\mu,\mu;\frac{1}{2}\left(-\frac{i\,a(m-2k)}{c}+\nu+2\right);-e^{-2cz},e^{-2cz}\right)}{i\,a(m-2k)-c\,\nu}\right)-\frac{1}{c\,\nu}\left(2^{-m}\left(1-e^{-2cz}\right)^\mu\left(1+e^{-2cz}\right)^{\nu-\mu}F_1\left(\frac{\nu}{2};\nu-\mu,\mu;\frac{\nu+2}{2};-e^{-2cz},e^{-2cz}\right)\binom{m}{\frac{m}{2}}\coth^\mu(c\,z)(1-m\bmod 2)\operatorname{sech}^\nu(c\,z)\right)/;\,m\in\mathbb{N}^+$$

Involving sin and csch

## Involving sin(a z) csch(c z) sech$^\nu$(c z)

01.24.21.0541.01

$$\int \sin(a\,z)\operatorname{csch}(c\,z)\operatorname{sech}^\nu(c\,z)\,dz = -i\,e^{-cz}\left(1+e^{-2cz}\right)^\nu\left(\frac{e^{i a z}}{i\,a-c(\nu+1)}F_1\left(\frac{\nu c+c-i\,a}{2c};\nu,1;-\frac{i\,a-c(\nu+3)}{2c};-e^{-2cz},e^{-2cz}\right)+\frac{e^{-i a z}}{\nu c+c+i\,a}F_1\left(\frac{\nu c+c+i\,a}{2c};\nu,1;\frac{i\,a+c(\nu+3)}{2c};-e^{-2cz},e^{-2cz}\right)\right)\operatorname{sech}^\nu(c\,z)$$

Involving powers of sin and powers of csch

## Involving sin$^m$(a z) csch$^\mu$(c z) sech$^\nu$(c z)

01.24.21.0542.01

$$\int \sin^m(a\,z)\operatorname{csch}^\mu(c\,z)\operatorname{sech}^\nu(c\,z)\,dz = 2^{-m}\left(1-e^{-2cz}\right)^\mu\left(1+e^{-2cz}\right)^{\nu}\operatorname{csch}^\mu(c\,z)\operatorname{sech}^\nu(c\,z)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(\frac{e^{i a(m-2k)z-\frac{i m\pi}{2}}F_1\left(\frac{c(\mu+\nu)-i\,a(m-2k)}{2c};\nu,\mu;\frac{c(\mu+\nu+2)-i\,a(m-2k)}{2c};-e^{-2cz},e^{-2cz}\right)}{i\,a(m-2k)-c(\mu+\nu)}+\frac{e^{\frac{i m\pi}{2}-i a(m-2k)z}F_1\left(\frac{a\,i(m-2k)+c(\mu+\nu)}{2c};\nu,\mu;\frac{a\,i(m-2k)+c(\mu+\nu+2)}{2c};-e^{-2cz},e^{-2cz}\right)}{-i\,a(m-2k)-c(\mu+\nu)}\right)-\frac{1}{c(\mu+\nu)}\left(2^{-m}\left(1-e^{-2cz}\right)^\mu\left(1+e^{-2cz}\right)^\nu F_1\left(\frac{\mu+\nu}{2};\nu,\mu;\frac{1}{2}(\mu+\nu+2);-e^{-2cz},e^{-2cz}\right)\binom{m}{\frac{m}{2}}\operatorname{csch}^\mu(c\,z)(1-m\bmod 2)\operatorname{sech}^\nu(c\,z)\right)/;\,m\in\mathbb{N}^+$$

Involving cos and csch

## Involving $\cos(a z)\, \text{csch}(c z)\, \text{sech}^{\nu}(c z)$

01.24.21.0543.01

$$\int \cos(a z)\, \text{csch}(c z)\, \text{sech}^{\nu}(c z)\, dz = e^{-c z} \left(1 + e^{-2 c z}\right)^{\nu} \left(\frac{e^{i a z}}{i a - c(\nu + 1)} F_1\left(\frac{\nu c + c - i a}{2 c}; \nu, 1; -\frac{i a - c(\nu + 3)}{2 c}; -e^{-2 c z}, e^{-2 c z}\right) + \frac{e^{-i a z}}{-i a - c(\nu + 1)} F_1\left(\frac{\nu c + c + i a}{2 c}; \nu, 1; \frac{i a + c(\nu + 3)}{2 c}; -e^{-2 c z}, e^{-2 c z}\right)\right) \text{sech}^{\nu}(c z)$$

Involving powers of cos and powers of csch

## Involving $\cos^m(a z)\, \text{csch}^{\mu}(c z)\, \text{sech}^{\nu}(c z)$

01.24.21.0544.01

$$\int \cos^m(a z)\, \text{csch}^{\mu}(c z)\, \text{sech}^{\nu}(c z)\, dz = 2^{-m} \left(1 - e^{-2 c z}\right)^{\mu} \left(1 + e^{-2 c z}\right)^{\nu} \text{csch}^{\mu}(c z)\, \text{sech}^{\nu}(c z) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left(\frac{e^{i a (m-2k) z} F_1\left(\frac{c(\mu+\nu) - i a (m-2k)}{2c}; \nu, \mu; \frac{c(\mu+\nu+2) - i a (m-2k)}{2c}; -e^{-2 c z}, e^{-2 c z}\right)}{i a (m - 2k) - c(\mu + \nu)} + \frac{e^{-i a (m-2k) z} F_1\left(\frac{a i (m-2k) + c(\mu+\nu)}{2c}; \nu, \mu; \frac{a i (m-2k) + c(\mu+\nu+2)}{2c}; -e^{-2 c z}, e^{-2 c z}\right)}{-i a (m - 2k) - c(\mu + \nu)}\right) - \frac{1}{c(\mu + \nu)} \left(2^{-m} \left(1 - e^{-2 c z}\right)^{\mu} \left(1 + e^{-2 c z}\right)^{\nu} F_1\left(\frac{\mu + \nu}{2}; \nu, \mu; \frac{1}{2}(\mu + \nu + 2); -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} \text{csch}^{\mu}(c z)\, (1 - m \bmod 2)\, \text{sech}^{\nu}(c z)\right) /;\, m \in \mathbb{N}^{+}$$

**Involving functions of the direct function, hyperbolic, exponential and a power functions**

## Involving powers of the direct function, hyperbolic, exponential and a power functions

Involving sinh, exp and power

## Involving $z^n\, e^{p z} \sinh(a + b z)\, \text{sech}^{\nu}(c z)$

01.24.21.0545.01

$$\int z^n e^{p z} \sinh(a + b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{2} \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z)\, n! \Bigg(e^{a+(p+b) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b + p + c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c \nu + p + b}{2 c}, \ldots, \frac{c \nu + p + b}{2 c}, \nu; \frac{c \nu + p + b}{2 c} + 1, \ldots, \frac{c \nu + p + b}{2 c} + 1; -e^{2 c z}\right) - e^{-a+(p-b) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-b + p + c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c \nu + p - b}{2 c}, \ldots, \frac{c \nu + p - b}{2 c}, \nu; \frac{c \nu + p - b}{2 c} + 1, \ldots, \frac{c \nu + p - b}{2 c} + 1; -e^{2 c z}\right)\Bigg) /; n \in \mathbb{N} \land p + b \neq -c \nu \land p - b \neq -c \nu$$

01.24.21.0546.01

$$\int z^n e^{(b-c \nu) z} \sinh(a + b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{2} \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \Bigg(-\frac{e^{-a-c \nu z} z^{n+1}}{n+1} + e^{a+z (2 b - c \nu)} n! \sum_{j=0}^{n} \frac{(-1)^j z^{n-j}}{(n-j)! (2 b)^{j+1}} {}_{j+2}F_{j+1}\left(\frac{b}{c}, \ldots, \frac{b}{c}, \nu; \frac{b}{c} + 1, \ldots, \frac{b}{c} + 1; -e^{2 c z}\right) + n! \, \nu \, e^{-a+(2-\nu) c z} \sum_{j=0}^{n} \frac{(-1)^j (2 c)^{-j-1} z^{n-j}}{(n-j)!} {}_{j+3}F_{j+2}\left(1, \ldots, 1, \nu + 1; 2, \ldots, 2; -e^{2 c z}\right)\Bigg) /; n \in \mathbb{N}$$

01.24.21.0547.01

$$\int z^n e^{-(b+c \nu) z} \sinh(a + b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{2} \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \Bigg(\frac{e^{a-c \nu z} z^{n+1}}{n+1} + e^{-a-z (2 b + c \nu)} n! \sum_{j=0}^{n} \frac{z^{n-j}}{(n-j)! (2 b)^{j+1}} {}_{j+2}F_{j+1}\left(-\frac{b}{c}, \ldots, -\frac{b}{c}, \nu; -\frac{b}{c} + 1, \ldots, -\frac{b}{c} + 1; -e^{2 c z}\right) - n! \, \nu \, e^{a+(2-\nu) c z} \sum_{j=0}^{n} \frac{(-1)^j (2 c)^{-j-1} z^{n-j}}{(n-j)!} {}_{j+3}F_{j+2}\left(1, \ldots, 1, \nu + 1; 2, \ldots, 2; -e^{2 c z}\right)\Bigg) /; n \in \mathbb{N}$$

01.24.21.0548.01

$$\int z^n e^{p z} \sinh(b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{2} \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z)\, n! \Bigg(-e^{(-b+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-b + p + c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c \nu + p - b}{2 c}, \ldots, \frac{c \nu + p - b}{2 c}, \nu; \frac{c \nu + p - b}{2 c} + 1, \ldots, \frac{c \nu + p - b}{2 c} + 1; -e^{2 c z}\right) + e^{(b+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b + p + c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c \nu + p + b}{2 c}, \ldots, \frac{c \nu + p + b}{2 c}, \nu; \frac{c \nu + p + b}{2 c} + 1, \ldots, \frac{c \nu + p + b}{2 c} + 1; -e^{2 c z}\right)\Bigg) /; n \in \mathbb{N} \land p + b \neq -c \nu \land p - b \neq -c \nu$$

01.24.21.0549.01

$$\int z^n e^{(b-c\nu)z} \sinh(b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{2}\left(1+e^{2cz}\right)^\nu \operatorname{sech}^\nu(c z)\left(-\frac{e^{-c\nu z} z^{n+1}}{n+1} + e^{c(2-\nu)z}\, \nu\, n! \sum_{j=0}^n \frac{(-1)^j z^{n-j} (2c)^{-j-1}}{(n-j)!}\, {}_{j+3}F_{j+2}\left(1, \ldots, 1, \nu+1; 2, \ldots, 2; -e^{2cz}\right) + e^{(2b-c\nu)z}\, n! \sum_{j=0}^n \frac{(-1)^j z^{n-j} (2b)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{b}{c}, \ldots, \frac{b}{c}, \nu; \frac{b}{c}+1, \ldots, \frac{b}{c}+1; -e^{2cz}\right)\right) /; n \in \mathbb{N}$$

01.24.21.0550.01

$$\int z^n e^{-(b+c\nu)z} \sinh(b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{2}\left(1+e^{2cz}\right)^\nu \operatorname{sech}^\nu(c z)\left(\frac{e^{-c\nu z} z^{n+1}}{n+1} - e^{c(2-\nu)z}\, \nu\, n! \sum_{j=0}^n \frac{(-1)^j z^{n-j} (2c)^{-j-1}}{(n-j)!}\, {}_{j+3}F_{j+2}\left(1, \ldots, 1, \nu+1; 2, \ldots, 2; -e^{2cz}\right) + e^{-(2b+c\nu)z}\, n! \sum_{j=0}^n \frac{z^{n-j} (2b)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(-\frac{b}{c}, \ldots, -\frac{b}{c}, \nu; -\frac{b}{c}+1, \ldots, -\frac{b}{c}+1; -e^{2cz}\right)\right) /; n \in \mathbb{N}$$

## Involving powers of sinh, exp and power

### Involving $z^n e^{p z} \sinh^u(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0551.01

$$\int z^n e^{p z} \sinh^u(b z) \operatorname{sech}^\nu(c z)\, dz = e^{p z}\left(1+e^{2cz}\right)^\nu \binom{u}{\frac{u}{2}} \left(\frac{i}{2}\right)^u n!\, (1 - u \bmod 2) \operatorname{sech}^\nu(c z) \sum_{j=0}^n \frac{(-1)^j z^{n-j} (p+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu+p}{2c}, \ldots, \frac{c\nu+p}{2c}, \nu; \frac{c\nu+p}{2c}+1, \ldots, \frac{c\nu+p}{2c}+1; -e^{2cz}\right) + 2^{-u}\left(1+e^{2cz}\right)^\nu i^u\, n! \operatorname{sech}^\nu(c z) \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{u}{k} \left(e^{(p+b(u-2k))z - \frac{i\pi u}{2}} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (p+b(u-2k)+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu+p+b(-2k+u)}{2c}, \ldots, \frac{c\nu+p+b(-2k+u)}{2c}, \nu; \frac{c\nu+p+b(-2k+u)}{2c}+1, \ldots, \frac{c\nu+p+b(-2k+u)}{2c}+1; -e^{2cz}\right) + e^{\frac{i\pi u}{2}+(p-b(u-2k))z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (p-b(u-2k)+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu+p-b(-2k+u)}{2c}, \ldots, \frac{c\nu+p-b(-2k+u)}{2c}, \nu; \frac{c\nu+p-b(-2k+u)}{2c}+1, \ldots, \frac{c\nu+p-b(-2k+u)}{2c}+1; -e^{2cz}\right)\right) /; n \in \mathbb{N} \land u \in \mathbb{N}^+$$

## Involving cosh, exp and power

## Involving $z^n e^{p z} \cosh(a + b z) \operatorname{sech}^\nu(c z)$

01.24.21.0552.01

$$\int z^n e^{p z} \cosh(a + b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{2} \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z)\, n! \Bigg(e^{a+(p+b) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (b + p + c \nu)^{-j-1}}{(n - j)!} {}_{j+2}F_{j+1}\!\left(\frac{c \nu + p + b}{2 c}, \ldots, \frac{c \nu + p + b}{2 c}, \nu; \frac{c \nu + p + b}{2 c} + 1, \ldots, \frac{c \nu + p + b}{2 c} + 1; -e^{2 c z}\right) + e^{-a+(p-b) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (-b + p + c \nu)^{-j-1}}{(n - j)!} {}_{j+2}F_{j+1}\!\left(\frac{c \nu + p - b}{2 c}, \ldots, \frac{c \nu + p - b}{2 c}, \nu; \frac{c \nu + p - b}{2 c} + 1, \ldots, \frac{c \nu + p - b}{2 c} + 1; -e^{2 c z}\right)\Bigg) /; n \in \mathbb{N} \land p + b \neq -c \nu \land p - b \neq -c \nu$$

01.24.21.0553.01

$$\int z^n e^{(b-c \nu) z} \cosh(a + b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{2} \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \left(\frac{e^{-a-c \nu z} z^{n+1}}{n + 1} + e^{a+z (2 b-c \nu)} n! \sum_{j=0}^n \frac{(-1)^j z^{n-j}}{(n - j)! (2 b)^{j+1}} {}_{j+2}F_{j+1}\!\left(\frac{b}{c}, \ldots, \frac{b}{c}, \nu; \frac{b}{c} + 1, \ldots, \frac{b}{c} + 1; -e^{2 c z}\right) - n!\, \nu\, e^{-a+(2-\nu) c z} \sum_{j=0}^n \frac{(-1)^j (2 c)^{-j-1} z^{n-j}}{(n - j)!} {}_{j+3}F_{j+2}\!\left(1, \ldots, 1, \nu + 1; 2, \ldots, 2; -e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

01.24.21.0554.01

$$\int z^n e^{-(b+c \nu) z} \cosh(a + b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{2} \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \left(\frac{e^{a-c \nu z} z^{n+1}}{n + 1} - e^{-a-z (2 b+c \nu)} n! \sum_{j=0}^n \frac{z^{n-j}}{(n - j)! (2 b)^{j+1}} {}_{j+2}F_{j+1}\!\left(-\frac{b}{c}, \ldots, -\frac{b}{c}, \nu; -\frac{b}{c} + 1, \ldots, -\frac{b}{c} + 1; -e^{2 c z}\right) - n!\, \nu\, e^{a+(2-\nu) c z} \sum_{j=0}^n \frac{(-1)^j (2 c)^{-j-1} z^{n-j}}{(n - j)!} {}_{j+3}F_{j+2}\!\left(1, \ldots, 1, \nu + 1; 2, \ldots, 2; -e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

01.24.21.0555.01

$$\int z^n e^{p z} \cosh(b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{2} \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z)\, n! \Bigg(e^{(-b+p) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (-b + p + c \nu)^{-j-1}}{(n - j)!} {}_{j+2}F_{j+1}\!\left(\frac{c \nu + p - b}{2 c}, \ldots, \frac{c \nu + p - b}{2 c}, \nu; \frac{c \nu + p - b}{2 c} + 1, \ldots, \frac{c \nu + p - b}{2 c} + 1; -e^{2 c z}\right) + e^{(b+p) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (b + p + c \nu)^{-j-1}}{(n - j)!} {}_{j+2}F_{j+1}\!\left(\frac{c \nu + p + b}{2 c}, \ldots, \frac{c \nu + p + b}{2 c}, \nu; \frac{c \nu + p + b}{2 c} + 1, \ldots, \frac{c \nu + p + b}{2 c} + 1; -e^{2 c z}\right)\Bigg) /; n \in \mathbb{N} \land p + b \neq -c \nu \land p - b \neq -c \nu$$

01.24.21.0556.01

$$\int z^n e^{(b-c\nu)z}\cosh(b z)\operatorname{sech}^\nu(c z)\,dz = \frac{1}{2}\left(1+e^{2cz}\right)^\nu \operatorname{sech}^\nu(c z)\left(\frac{e^{-c\nu z} z^{n+1}}{n+1} + e^{z(2b-c\nu)} n! \sum_{j=0}^{n} \frac{(-1)^j z^{n-j}}{(n-j)!\,(2b)^{j+1}} \,{}_{j+2}F_{j+1}\!\left(\frac{b}{c}, \ldots, \frac{b}{c}, \nu; \frac{b}{c}+1, \ldots, \frac{b}{c}+1; -e^{2cz}\right) - n!\,\nu\, e^{(2-\nu)cz} \sum_{j=0}^{n} \frac{(-1)^j (2c)^{-j-1} z^{n-j}}{(n-j)!} \,{}_{j+3}F_{j+2}\!\left(1, \ldots, 1, \nu+1; 2, \ldots, 2; -e^{2cz}\right)\right) /; n \in \mathbb{N}$$

01.24.21.0557.01

$$\int z^n e^{-(b+c\nu)z}\cosh(b z)\operatorname{sech}^\nu(c z)\,dz = \frac{1}{2}\left(1+e^{2cz}\right)^\nu \operatorname{sech}^\nu(c z) \left(\frac{e^{-c\nu z} z^{n+1}}{n+1} - e^{-z(2b+c\nu)} n! \sum_{j=0}^{n} \frac{z^{n-j}}{(n-j)!\,(2b)^{j+1}} \,{}_{j+2}F_{j+1}\!\left(-\frac{b}{c}, \ldots, -\frac{b}{c}, \nu; -\frac{b}{c}+1, \ldots, -\frac{b}{c}+1; -e^{2cz}\right) - n!\,\nu\, e^{(2-\nu)cz} \sum_{j=0}^{n} \frac{(-1)^j (2c)^{-j-1} z^{n-j}}{(n-j)!} \,{}_{j+3}F_{j+2}\!\left(1, \ldots, 1, \nu+1; 2, \ldots, 2; -e^{2cz}\right)\right) /; n \in \mathbb{N}$$

Involving powers of cosh, exp and power

## Involving $z^n e^{pz} \cosh^u(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0558.01

$$\int z^n e^{pz} \cosh^u(b z)\operatorname{sech}^\nu(c z)\,dz = e^{pz}\left(1+e^{2cz}\right)^\nu \binom{u}{\frac{u}{2}} 2^{-u} n!\,(1-u \bmod 2)\operatorname{sech}^\nu(c z) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+c\nu)^{-j-1}}{(n-j)!} \,{}_{j+2}F_{j+1}\!\left(\frac{c\nu+p}{2c}, \ldots, \frac{c\nu+p}{2c}, \nu; \frac{c\nu+p}{2c}+1, \ldots, \frac{c\nu+p}{2c}+1; -e^{2cz}\right) + 2^{-u}\left(1+e^{2cz}\right)^\nu n! \operatorname{sech}^\nu(c z) \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{k} \left(e^{(p+b(u-2k))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+b(u-2k)+c\nu)^{-j-1}}{(n-j)!} \,{}_{j+2}F_{j+1}\!\left(\frac{c\nu+p+b(-2k+u)}{2c}, \ldots, \frac{c\nu+p+b(-2k+u)}{2c}, \nu; \frac{c\nu+p+b(-2k+u)}{2c}+1, \ldots, \frac{c\nu+p+b(-2k+u)}{2c}+1; -e^{2cz}\right) + e^{(p-b(u-2k))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p-b(u-2k)+c\nu)^{-j-1}}{(n-j)!} \,{}_{j+2}F_{j+1}\!\left(\frac{c\nu+p-b(-2k+u)}{2c}, \ldots, \frac{c\nu+p-b(-2k+u)}{2c}, \nu; \frac{c\nu+p-b(-2k+u)}{2c}+1, \ldots, \frac{c\nu+p-b(-2k+u)}{2c}+1; -e^{2cz}\right)\right) /; n \in \mathbb{N} \land u \in \mathbb{N}^+$$

Involving tanh, exp and power

## Involving $z^n e^{pz} \tanh(c z) \operatorname{sech}^\nu(c z)$

01.24.21.0559.01

$$\int z^n e^{pz}\tanh(cz)\operatorname{sech}^\nu(cz)\,dz = \frac{1}{2}\left(1+e^{2cz}\right)^{\nu+1} n!\operatorname{sech}^{\nu+1}(cz)\left(e^{(c+p)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p+c(\nu+2))^{-j-1}}{(n-j)!}\right.$$
$$ {}_{j+2}F_{j+1}\left(\frac{p+c(\nu+2)}{2c},\ldots,\frac{p+c(\nu+2)}{2c},\nu+1;\frac{p+c(\nu+2)}{2c}+1,\ldots,\frac{p+c(\nu+2)}{2c}+1;-e^{2cz}\right)-$$
$$\left. e^{(p-c)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{p+c\nu}{2c},\ldots,\frac{p+c\nu}{2c},\nu+1;\frac{p+c\nu}{2c}+1,\ldots,\frac{p+c\nu}{2c}+1;-e^{2cz}\right)\right)/;n\in\mathbb{N}\land p\neq -c(\nu+2)\land p\neq -c\nu$$

01.24.21.0560.01

$$\int z^n e^{-c\nu z}\tanh(cz)\operatorname{sech}^\nu(cz)\,dz =$$
$$\left(1+e^{2cz}\right)^{\nu}\operatorname{sech}^\nu(cz)\left(e^{zc(2-\nu)} n!\sum_{j=0}^{n}\frac{1}{(n-j)!}\left((-1)^j z^{n-j}(2c)^{-j-1}\left({}_{j+2}F_{j+1}\left(1,\ldots,1,\nu+1;2,\ldots,2;-e^{2cz}\right)+\right.\right.\right.$$
$$\left.\left.\left.(\nu+1)\,{}_{j+3}F_{j+2}\left(1,\ldots,1,\nu+2;2,\ldots,2;-e^{2cz}\right)\right)\right)-\frac{e^{-c\nu z}z^{n+1}}{n+1}\right)/;n\in\mathbb{N}$$

Involving powers of tanh, exp and power

## Involving $z^n e^{pz}\tanh^u(cz)\operatorname{sech}^\nu(cz)$

01.24.21.0561.01

$$\int z^n e^{pz}\tanh^u(cz)\operatorname{sech}^\nu(cz)\,dz =$$
$$e^{pz}\left(1+e^{2cz}\right)^{u+\nu}\binom{u}{\frac{u}{2}} n!\,(1-u\bmod 2)\operatorname{sech}^{u+\nu}(cz)\left(\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(p+c(u+\nu))^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{p+c(u+\nu)}{2c},\ldots,\right.\right.$$
$$\left.\left.\frac{p+c(u+\nu)}{2c},u+\nu;\frac{p+c(u+\nu)}{2c}+1,\ldots,\frac{p+c(u+\nu)}{2c}+1;-e^{2cz}\right)\right)\left(\frac{i}{2}\right)^u+2^{-u}\left(1+e^{2cz}\right)^{u+\nu}n!$$
$$\operatorname{sech}^{u+\nu}(cz)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\left((-1)^u e^{(p-c(u-2k))z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(c(2k+\nu)+p)^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{p+c(2k+\nu)}{2c},\right.\right.$$
$$\left.\ldots,\frac{p+c(2k+\nu)}{2c},u+\nu;\frac{p+c(2k+\nu)}{2c}+1,\ldots,\frac{p+c(2k+\nu)}{2c}+1;-e^{2cz}\right)+e^{(p+c(u-2k))z}$$
$$\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(c(-2k+2u+\nu)+p)^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{p+c(-2k+2u+\nu)}{2c},\ldots,\frac{p+c(-2k+2u+\nu)}{2c},\right.$$
$$\left.\left.u+\nu;\frac{p+c(-2k+2u+\nu)}{2c}+1,\ldots,\frac{p+c(-2k+2u+\nu)}{2c}+1;-e^{2cz}\right)\right)/;n\in\mathbb{N}\land u\in\mathbb{N}^+$$

Involving powers of coth, exp and power

## Involving $z^n e^{pz} \coth^u(cz) \operatorname{sech}^\nu(cz)$

01.24.21.0562.01

$$\int z^n e^{pz} \coth^u(cz) \operatorname{sech}^\nu(cz)\, dz = (-1)^u 2^\nu e^{(p+cu)z} \binom{u-\nu}{\frac{u-\nu}{2}} n!\,(1-(u-\nu) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (p+cu)^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{p+cu}{2c}, \ldots, \frac{p+cu}{2c}, u; \frac{p+cu}{2c}+1, \ldots, \frac{p+cu}{2c}+1; e^{2cz}\right) + (-1)^u 2^\nu e^{cuz} n! \sum_{k=0}^{\left\lfloor \frac{1}{2}(u-\nu-1)\right\rfloor} \binom{u-\nu}{k} \left(e^{(p+c(-2k+u-\nu))z} \sum_{j=0}^{n} \frac{(-1)^j (p+c(-2k+2u-\nu))^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{p+c(-2k+2u-\nu)}{2c}, \ldots, \frac{p+c(-2k+2u-\nu)}{2c}, u; \frac{p+c(-2k+2u-\nu)}{2c}+1, \ldots, \frac{p+c(-2k+2u-\nu)}{2c}+1; e^{2cz}\right) + e^{(p-c(-2k+u-\nu))z} \sum_{j=0}^{n} \frac{(-1)^j (p+c(2k+\nu))^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{p+c(2k+\nu)}{2c}, \ldots, \frac{p+c(2k+\nu)}{2c}, u; \frac{p+c(2k+\nu)}{2c}+1, \ldots, \frac{p+c(2k+\nu)}{2c}+1; e^{2cz}\right)\right) /;\, n \in \mathbb{N} \land u \in \mathbb{Z} \land u \geq \nu \land \nu \in \mathbb{N}^+$$

**Involving functions of the direct function, hyperbolic, exponential and trigonometric functions**

## Involving powers of the direct function, hyperbolic, exponential and trigonometric functions

### Involving sin, sinh and exp

## Involving $e^{pz} \sin(az) \sinh(bz) \operatorname{sech}^\nu(cz)$

01.24.21.0563.01

$$\int e^{pz} \sin(az) \sinh(bz) \operatorname{sech}^\nu(cz)\, dz = \frac{1}{4}\left(1+e^{2cz}\right)^\nu \operatorname{sech}^\nu(cz) \left(\frac{e^{\frac{i\pi}{2}+(-b+ia+p)z}\, {}_2F_1\left(\frac{-b+ia+p+c\nu}{2c}, \nu; \frac{-b+ia+p+c\nu}{2c}+1; -e^{2cz}\right)}{-b+ia+p+c\nu} - \frac{e^{\frac{i\pi}{2}+(-b-ia+p)z}\, {}_2F_1\left(\frac{-b-ia+p+c\nu}{2c}, \nu; \frac{-b-ia+p+c\nu}{2c}+1; -e^{2cz}\right)}{-b-ia+p+c\nu} + \frac{e^{-\frac{1}{2}(i\pi)+(b+ia+p)z}\, {}_2F_1\left(\frac{b+ia+p+c\nu}{2c}, \nu; \frac{b+ia+p+c\nu}{2c}+1; -e^{2cz}\right)}{b+ia+p+c\nu} - \frac{e^{-\frac{1}{2}(i\pi)+(b-ia+p)z}\, {}_2F_1\left(\frac{b-ia+p+c\nu}{2c}, \nu; \frac{b-ia+p+c\nu}{2c}+1; -e^{2cz}\right)}{b-ia+p+c\nu}\right)$$

### Involving powers of sin, powers of sinh and exp

## Involving $e^{pz} \sin^m(az) \sinh^u(bz) \operatorname{sech}^\nu(cz)$

01.24.21.0564.01

$$\int e^{pz}\sin^m(az)\sinh^u(bz)\operatorname{sech}^\nu(cz)\,dz = \frac{1}{p+c\nu} i^u 2^{-m-u} e^{pz}\left(1+e^{2cz}\right)^\nu \operatorname{sech}^\nu(cz)\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}(1-m\bmod 2)(1-u\bmod 2)\,{}_2F_1\left(\frac{p+c\nu}{2c},\nu;\frac{p+c\nu}{2c}+1;-e^{2cz}\right)+ \left(\frac{i}{2}\right)^{m+u}\binom{u}{\frac{u}{2}}(1-u\bmod 2)\operatorname{sech}^\nu(cz)\left(1+e^{2cz}\right)^\nu \sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(\frac{e^{(p-ia(m-2k))z}\,{}_2F_1\left(\frac{ai(2k-m)+p+c\nu}{2c},\nu;\frac{ai(2k-m)+p+c\nu}{2c}+1;-e^{2cz}\right)}{ai(2k-m)+p+c\nu}+ \frac{(-1)^m e^{(ai(m-2k)+p)z}\,{}_2F_1\left(\frac{ai(m-2k)+p+c\nu}{2c},\nu;\frac{ai(m-2k)+p+c\nu}{2c}+1;-e^{2cz}\right)}{ai(m-2k)+p+c\nu}\right)+2^{-m-u}\binom{m}{\frac{m}{2}}(1-m\bmod 2) \left(1+e^{2cz}\right)^\nu\operatorname{sech}^\nu(cz)\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}\left(\frac{e^{(p+b(u-2s))z}\,{}_2F_1\left(\frac{p+b(u-2s)+c\nu}{2c},\nu;\frac{p+b(u-2s)+c\nu}{2c}+1;-e^{2cz}\right)}{p+b(u-2s)+c\nu}+ \frac{(-1)^u e^{(p-b(u-2s))z}\,{}_2F_1\left(\frac{p-b(u-2s)+c\nu}{2c},\nu;\frac{p-b(u-2s)+c\nu}{2c}+1;-e^{2cz}\right)}{p-b(u-2s)+c\nu}\right)+2^{-m-u}\left(1+e^{2cz}\right)^\nu\operatorname{sech}^\nu(cz) \sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}\left(\left((-1)^u e^{(ai(m-2k)+p-b(u-2s))z-\frac{i m\pi}{2}}\,{}_2F_1\left(\frac{ai(m-2k)+p+b(2s-u)+c\nu}{2c},\nu;\frac{ai(m-2k)+p+b(2s-u)+c\nu}{2c}+1;-e^{2cz}\right)\right)\Big/(ai(m-2k)+p-b(u-2s)+c\nu)+ \left((-1)^u e^{\frac{i\pi m}{2}+(-ia(m-2k)+p-b(u-2s))z}\,{}_2F_1\left(\frac{2iak-iam+p+2bs-bu+c\nu}{2c},\nu;\frac{2iak-iam+p+2bs-bu+c\nu}{2c}+1;-e^{2cz}\right)\right)\Big/(-ia(m-2k)+p-b(u-2s)+c\nu)+ \left(e^{\frac{i\pi m}{2}+(-ia(m-2k)+p+b(u-2s))z}\,{}_2F_1\left(\frac{-ia(m-2k)+p+b(u-2s)+c\nu}{2c},\nu;\frac{-ia(m-2k)+p+b(u-2s)+c\nu}{2c}+1;-e^{2cz}\right)\right)\Big/(-ia(m-2k)+p+b(u-2s)+c\nu)+ \left(e^{(ai(m-2k)+p+b(u-2s))z-\frac{i m\pi}{2}}\,{}_2F_1\left(\frac{ai(m-2k)+p+b(u-2s)+c\nu}{2c},\nu;\frac{ai(m-2k)+p+b(u-2s)+c\nu}{2c}+1;-e^{2cz}\right)\right)\Big/(ai(m-2k)+p+b(u-2s)+c\nu)\right)\;/;\; m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

01.24.21.0565.01

$$\int e^{pz}\sin^m(az)\sinh^\mu(cz)\operatorname{sech}^\nu(cz)\,dz = 2^{-m}\left(1-e^{-2cz}\right)^{-\mu}\left(1+e^{-2cz}\right)^{\nu}\operatorname{sech}^\nu(cz)\sinh^\mu(cz)\left(e^{-\frac{1}{2}i m\pi}\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(\left((-1)^m e^{(a i(2k-m)+p)z} F_1\left(-\frac{-i a(m-2k)+p+c\mu-c\nu}{2c};\nu,-\mu;\frac{a i(m-2k)-p+c(-\mu+\nu+2)}{2c};-e^{-2cz},e^{-2cz}\right)\right)\Big/(-i a(m-2k)+p+c(\mu-\nu))+\left(e^{(a i(m-2k)+p)z}F_1\left(-\frac{a i(m-2k)+p+c\mu-c\nu}{2c};\nu,-\mu;-\frac{a i(m-2k)+p+c(\mu-\nu-2)}{2c};-e^{-2cz},e^{-2cz}\right)\right)\Big/(a i(m-2k)+p+c(\mu-\nu))\right)-\frac{e^{pz}(m\bmod 2-1)}{p+c(\mu-\nu)}F_1\left(-\frac{p+c\mu-c\nu}{2c};\nu,-\mu;\frac{c(-\mu+\nu+2)-p}{2c};-e^{-2cz},e^{-2cz}\right)\binom{m}{\frac{m}{2}}\right)\;/;\;m\in\mathbb{N}^+$$

## Involving cos, sinh and exp

### Involving $e^{pz}\cos(az)\sinh(bz)\operatorname{sech}^\nu(cz)$

01.24.21.0566.01

$$\int e^{pz}\cos(az)\sinh(bz)\operatorname{sech}^\nu(cz)\,dz = \frac{1}{4}i\left(1+e^{2cz}\right)^\nu\operatorname{sech}^\nu(cz)\left(\frac{e^{\frac{i\pi}{2}+(-b+ia+p)z}\,{}_2F_1\left(\frac{-b+ia+p+c\nu}{2c},\nu;\frac{-b+ia+p+c\nu}{2c}+1;-e^{2cz}\right)}{-b+ia+p+c\nu}+\frac{e^{\frac{i\pi}{2}+(-b-ia+p)z}\,{}_2F_1\left(\frac{-b-ia+p+c\nu}{2c},\nu;\frac{-b-ia+p+c\nu}{2c}+1;-e^{2cz}\right)}{-b-ia+p+c\nu}+\frac{e^{-\frac{1}{2}(i\pi)+(b+ia+p)z}\,{}_2F_1\left(\frac{b+ia+p+c\nu}{2c},\nu;\frac{b+ia+p+c\nu}{2c}+1;-e^{2cz}\right)}{b+ia+p+c\nu}+\frac{e^{-\frac{1}{2}(i\pi)+(b-ia+p)z}\,{}_2F_1\left(\frac{b-ia+p+c\nu}{2c},\nu;\frac{b-ia+p+c\nu}{2c}+1;-e^{2cz}\right)}{b-ia+p+c\nu}\right)$$

## Involving powers of cos, powers of sinh and exp

### Involving $e^{pz}\cos^m(az)\sinh^u(bz)\operatorname{sech}^\nu(cz)$

01.24.21.0567.01

$$\int e^{p z} \cos^m(a z) \sinh^u(b z) \operatorname{sech}^\nu(c z) \, dz = \frac{1}{p+c\nu}\left(i^u 2^{-m-u} e^{p z}\left(1+e^{2cz}\right)^\nu \binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}(1-m \bmod 2)(1-u \bmod 2)\operatorname{sech}^\nu(cz)\, {}_2F_1\left(\frac{p+c\nu}{2c}, \nu; \frac{p+c\nu}{2c}+1; -e^{2cz}\right)\right) -$$
$$i^u 2^{-m-u}\binom{u}{\frac{u}{2}}(u \bmod 2 - 1)\operatorname{sech}^\nu(cz)\left(1+e^{2cz}\right)^\nu$$
$$\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(\frac{e^{(p+a i (m-2s))z}\, {}_2F_1\left(\frac{p+a i (m-2s)+c\nu}{2c}, \nu; \frac{p+a i (m-2s)+c\nu}{2c}+1; -e^{2cz}\right)}{p+a i (m-2s)+c\nu} +\right.$$
$$\left.\frac{e^{(p-i a (m-2s))z}\, {}_2F_1\left(\frac{p-i a (m-2s)+c\nu}{2c}, \nu; \frac{p-i a (m-2s)+c\nu}{2c}+1; -e^{2cz}\right)}{p-i a (m-2s)+c\nu}\right) + i^u 2^{-m-u}\binom{m}{\frac{m}{2}}(1-m \bmod 2)$$
$$\operatorname{sech}^\nu(cz)\left(1+e^{2cz}\right)^\nu \sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\left(\frac{e^{(p+b(u-2k))z-\frac{i\pi u}{2}}\, {}_2F_1\left(\frac{p+b(u-2k)+c\nu}{2c}, \nu; \frac{p+b(u-2k)+c\nu}{2c}+1; -e^{2cz}\right)}{p+b(u-2k)+c\nu} +\right.$$
$$\left.\frac{e^{\frac{i\pi u}{2}+(p-b(u-2k))z}\, {}_2F_1\left(\frac{p-b(u-2k)+c\nu}{2c}, \nu; \frac{p-b(u-2k)+c\nu}{2c}+1; -e^{2cz}\right)}{p-b(u-2k)+c\nu}\right) +$$
$$i^u 2^{-m-u}\operatorname{sech}^\nu(cz)\left(1+e^{2cz}\right)^\nu \sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{s}\binom{u}{k}\left(\left(e^{(p+a i (m-2s)+b(u-2k))z-\frac{i\pi u}{2}}\right.\right.$$
$$\left.{}_2F_1\left(\frac{p+a i (m-2s)+b(u-2k)+c\nu}{2c}, \nu; \frac{p+a i (m-2s)+b(u-2k)+c\nu}{2c}+1; -e^{2cz}\right)\right) \Big/$$
$$(p+a i (m-2s)+b(u-2k)+c\nu) + \left(e^{(p-i a (m-2s)+b(u-2k))z-\frac{i\pi u}{2}}\right.$$
$$\left.{}_2F_1\left(\frac{p-i a (m-2s)+b(u-2k)+c\nu}{2c}, \nu; \frac{p-i a (m-2s)+b(u-2k)+c\nu}{2c}+1; -e^{2cz}\right)\right) \Big/$$
$$(p-i a (m-2s)+b(u-2k)+c\nu) + \left(e^{\frac{i\pi u}{2}+(p+a i (m-2s)-b(u-2k))z}\, {}_2F_1\left(\frac{p+a i (m-2s)-b(u-2k)+c\nu}{2c},\right.\right.$$
$$\left.\left.\nu; \frac{p+a i (m-2s)-b(u-2k)+c\nu}{2c}+1; -e^{2cz}\right)\right) \Big/ (p+a i (m-2s)-b(u-2k)+c\nu) +$$
$$\left(e^{\frac{i\pi u}{2}+(p-i a (m-2s)-b(u-2k))z}\, {}_2F_1\left(\frac{p-i a (m-2s)-b(u-2k)+c\nu}{2c}, \nu; \frac{p-i a (m-2s)-b(u-2k)+c\nu}{2c}+1;\right.\right.$$
$$\left.\left.\left.-e^{2cz}\right)\right) \Big/ (p-i a (m-2s)-b(u-2k)+c\nu)\right) /;\ m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

01.24.21.0568.01

$$\int e^{p z} \cos^m(a z) \sinh^\mu(c z) \operatorname{sech}^\nu(c z) \, dz = \frac{(1 - m \bmod 2)}{p + c(\mu - \nu)} \binom{m}{\frac{m}{2}} 2^{-m} e^{p z} \left(1 + e^{-2 c z}\right)^\nu \left(1 - e^{-2 c z}\right)^{-\mu} \operatorname{sech}^\nu(c z) \sinh^\mu(c z) F_1\left(-\frac{p + c\mu - c\nu}{2 c}; \nu, -\mu; \frac{c(-\mu + \nu + 2) - p}{2 c}; -e^{-2 c z}, e^{-2 c z}\right) + 2^{-m} \left(1 + e^{-2 c z}\right)^\nu \left(1 - e^{-2 c z}\right)^{-\mu} \operatorname{sech}^\nu(c z) \sinh^\mu(c z) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left(\left(e^{(p - i a (m - 2 k)) z} F_1\left(-\frac{-i a (m - 2 k) + p + c\mu - c\nu}{2 c}; \nu, -\mu; \frac{a i (m - 2 k) - p + c(-\mu + \nu + 2)}{2 c}; -e^{-2 c z}, e^{-2 c z}\right)\right) \Big/ (-i a (m - 2 k) + p + c(\mu - \nu)) + \left(e^{(a i (m - 2 k) + p) z} F_1\left(-\frac{a i (m - 2 k) + p + c\mu - c\nu}{2 c}; \nu, -\mu; \frac{-i a (m - 2 k) - p + c(-\mu + \nu + 2)}{2 c}; -e^{-2 c z}, e^{-2 c z}\right)\right) \Big/ (a i (m - 2 k) + p + c(\mu - \nu))\right) /; m \in \mathbb{N}^+$$

## Involving sin, cosh and exp

### Involving $e^{p z} \sin(a z) \cosh(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0569.01

$$\int e^{p z} \sin(a z) \cosh(b z) \operatorname{sech}^\nu(c z) \, dz = \frac{1}{4} \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \left(-\frac{e^{\frac{i\pi}{2} + (-b + i a + p) z} {}_2F_1\left(\frac{-b + i a + p + c\nu}{2 c}, \nu; \frac{-b + i a + p + c\nu}{2 c} + 1; -e^{2 c z}\right)}{-b + i a + p + c\nu} + \frac{e^{\frac{i\pi}{2} + (-b - i a + p) z} {}_2F_1\left(\frac{-b - i a + p + c\nu}{2 c}, \nu; \frac{-b - i a + p + c\nu}{2 c} + 1; -e^{2 c z}\right)}{-b - i a + p + c\nu} + \frac{e^{-\frac{1}{2}(i\pi) + (b + i a + p) z} {}_2F_1\left(\frac{b + i a + p + c\nu}{2 c}, \nu; \frac{b + i a + p + c\nu}{2 c} + 1; -e^{2 c z}\right)}{b + i a + p + c\nu} - \frac{e^{-\frac{1}{2}(i\pi) + (b - i a + p) z} {}_2F_1\left(\frac{b - i a + p + c\nu}{2 c}, \nu; \frac{b - i a + p + c\nu}{2 c} + 1; -e^{2 c z}\right)}{b - i a + p + c\nu}\right)$$

## Involving powers of sin, powers of cosh and exp

### Involving $e^{p z} \sin^m(a z) \cosh^u(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0570.01

$$\int e^{p z} \sin^m(a z) \cosh^u(b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{p+c\nu}\left(2^{-m-u} e^{p z} \left(1+e^{2cz}\right)^\nu \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} {}_2F_1\!\left(\frac{p+c\nu}{2c}, \nu; \frac{p+c\nu}{2c}+1; -e^{2cz}\right)(1-m \bmod 2)(1-u \bmod 2) \operatorname{sech}^\nu(c z)\right) +$$

$$2^{-m-u}\left(1+e^{2cz}\right)^\nu \binom{u}{\frac{u}{2}} (1-u \bmod 2) \left(\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left(\frac{e^{(a i (m-2k)+p) z - \frac{i m \pi}{2}}\, {}_2F_1\!\left(\frac{a i (m-2k)+p+c\nu}{2c}, \nu; \frac{a i (m-2k)+p+c\nu}{2c}+1; -e^{2cz}\right)}{a i (m-2k)+p+c\nu} + \frac{e^{\frac{i \pi m}{2}+(p-i a (m-2k)) z}\, {}_2F_1\!\left(\frac{-i a (m-2k)+p+c\nu}{2c}, \nu; \frac{-i a (m-2k)+p+c\nu}{2c}+1; -e^{2cz}\right)}{-i a (m-2k)+p+c\nu}\right)\right) \operatorname{sech}^\nu(c z) -$$

$$2^{-m-u} \binom{m}{\frac{m}{2}} (m \bmod 2 - 1)\left(1+e^{2cz}\right)^\nu \left(\sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(\frac{e^{(p+b(u-2s)) z}\, {}_2F_1\!\left(\frac{p+b(u-2s)+c\nu}{2c}, \nu; \frac{p+b(u-2s)+c\nu}{2c}+1; -e^{2cz}\right)}{p+b(u-2s)+c\nu} + \frac{e^{(p-b(u-2s)) z}\, {}_2F_1\!\left(\frac{p-b(u-2s)+c\nu}{2c}, \nu; \frac{p-b(u-2s)+c\nu}{2c}+1; -e^{2cz}\right)}{p-b(u-2s)+c\nu}\right)\right) \operatorname{sech}^\nu(c z) +$$

$$2^{-m-u}\left(1+e^{2cz}\right)^\nu \left(\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \binom{u}{s} \left(\left(e^{(a i (m-2k)+p-b(u-2s)) z - \frac{i m \pi}{2}}\, {}_2F_1\!\left(\frac{a i (m-2k)+p+b(2s-u)+c\nu}{2c}, \nu; \frac{a i (m-2k)+p+b(2s-u)+c\nu}{2c}+1; -e^{2cz}\right)\right) \Big/ (a i (m-2k)+p-b(u-2s)+c\nu) + \left(e^{\frac{i \pi m}{2}+(-i a (m-2k)+p-b(u-2s)) z}\, {}_2F_1\!\left(\frac{2 i a k - i a m + p + 2 b s - b u + c\nu}{2c}, \nu; \frac{2 i a k - i a m + p + 2 b s - b u + c\nu}{2c}+1; -e^{2cz}\right)\right) \Big/ (-i a (m-2k)+p-b(u-2s)+c\nu) + \left(e^{\frac{i \pi m}{2}+(-i a (m-2k)+p+b(u-2s)) z}\, {}_2F_1\!\left(\frac{-i a (m-2k)+p+b(u-2s)+c\nu}{2c}, \nu; \frac{-i a (m-2k)+p+b(u-2s)+c\nu}{2c}+1; -e^{2cz}\right)\right) \Big/ (-i a (m-2k)+p+b(u-2s)+c\nu) + \left(e^{(a i (m-2k)+p+b(u-2s)) z - \frac{i m \pi}{2}}\, {}_2F_1\!\left(\frac{a i (m-2k)+p+b(u-2s)+c\nu}{2c}, \nu; \frac{a i (m-2k)+p+b(u-2s)+c\nu}{2c}+1; -e^{2cz}\right)\right) \Big/ (a i (m-2k)+p+b(u-2s)+c\nu)\right)\right) \operatorname{sech}^\nu(c z) \;/;\; m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

01.24.21.0571.01

$$\int e^{p z} \sin^m(a z) \cosh^\mu(c z) \operatorname{sech}^\nu(c z) \, dz = \frac{1}{p + c(\nu-\mu)} 2^{-m} e^{p z} \left(1 + e^{2 c z}\right)^{\nu-\mu} \binom{m}{\frac{m}{2}} {}_2F_1\left(\frac{p - c\mu + c\nu}{2c}, \nu-\mu; \frac{p + c(-\mu+\nu+2)}{2c}; -e^{2 c z}\right) (1 - m \bmod 2) \operatorname{sech}^\nu(c z) \cosh^\mu(c z) + 2^{-m} \left(1 + e^{2 c z}\right)^{\nu-\mu} \operatorname{sech}^\nu(c z) \cosh^\mu(c z) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left( \frac{e^{\frac{i\pi m}{2} + (p - i a(m-2k)) z}}{-i a(m-2k) + p + c(\nu-\mu)} {}_2F_1\left(\frac{-i a(m-2k) + p - c\mu + c\nu}{2c}, \nu-\mu; \frac{-i a(m-2k) + p + c(-\mu+\nu+2)}{2c}; -e^{2 c z}\right) + \frac{e^{(a i(m-2k)+p) z - \frac{i m \pi}{2}}}{a i(m-2k) + p + c(\nu-\mu)} {}_2F_1\left(\frac{a i(m-2k) + p - c\mu + c\nu}{2c}, \nu-\mu; \frac{a i(m-2k) + p + c(-\mu+\nu+2)}{2c}; -e^{2 c z}\right)\right) /; m \in \mathbb{N}^+$$

## Involving cos, cosh and exp

### Involving $e^{p z} \cos(a z) \cosh(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0572.01

$$\int e^{p z} \cos(a z) \cosh(b z) \operatorname{sech}^\nu(c z) \, dz = \frac{1}{4} i \left(1 + e^{2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \left( -\frac{e^{\frac{i\pi}{2} + (-b + i a + p) z} {}_2F_1\left(\frac{-b + i a + p + c\nu}{2c}, \nu; \frac{-b + i a + p + c\nu}{2c} + 1; -e^{2 c z}\right)}{-b + i a + p + c\nu} - \frac{e^{\frac{i\pi}{2} + (-b - i a + p) z} {}_2F_1\left(\frac{-b - i a + p + c\nu}{2c}, \nu; \frac{-b - i a + p + c\nu}{2c} + 1; -e^{2 c z}\right)}{-b - i a + p + c\nu} + \frac{e^{-\frac{1}{2}(i\pi) + (b + i a + p) z} {}_2F_1\left(\frac{b + i a + p + c\nu}{2c}, \nu; \frac{b + i a + p + c\nu}{2c} + 1; -e^{2 c z}\right)}{b + i a + p + c\nu} + \frac{e^{-\frac{1}{2}(i\pi) + (b - i a + p) z} {}_2F_1\left(\frac{b - i a + p + c\nu}{2c}, \nu; \frac{b - i a + p + c\nu}{2c} + 1; -e^{2 c z}\right)}{b - i a + p + c\nu} \right)$$

## Involving powers of cos, powers of cosh and exp

### Involving $e^{p z} \cos^m(a z) \cosh^u(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0573.01

$$\int e^{pz}\cos^m(az)\cosh^u(bz)\operatorname{sech}^\nu(cz)\,dz = \frac{1}{p+c\nu}\left(2^{-m-u}e^{pz}\left(1+e^{2cz}\right)^\nu\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}\,{}_2F_1\left(\frac{p}{2c}+\frac{\nu}{2},\nu;\frac{p}{2c}+\frac{\nu}{2}+1;-e^{2cz}\right)(1-m\bmod 2)(1-u\bmod 2)\operatorname{sech}^\nu(cz)\right)-$$
$$2^{-m-u}\binom{u}{\frac{u}{2}}(u\bmod 2-1)\left(1+e^{2cz}\right)^\nu\operatorname{sech}^\nu(cz)$$
$$\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(\frac{e^{(p-ia(m-2s))z}}{p-ia(m-2s)+c\nu}\,{}_2F_1\left(-\frac{iam}{2c}+\frac{p}{2c}+\frac{ias}{c}+\frac{\nu}{2},\nu;-\frac{iam}{2c}+\frac{p}{2c}+\frac{ias}{c}+\frac{\nu}{2}+1;-e^{2cz}\right)+\right.$$
$$\left.\frac{e^{(p+ai(m-2s))z}\,{}_2F_1\left(\frac{iam}{2c}+\frac{p}{2c}+\frac{\nu}{2}-\frac{ias}{c},\nu;\frac{iam}{2c}+\frac{p}{2c}+\frac{\nu}{2}-\frac{ias}{c}+1;-e^{2cz}\right)}{p+ai(m-2s)+c\nu}\right)+2^{-m-u}\left(1+e^{2cz}\right)^\nu\binom{m}{\frac{m}{2}}$$
$$(1-m\bmod 2)\operatorname{sech}^\nu(cz)\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(\frac{e^{(p+b(u-2s))z}\,{}_2F_1\left(\frac{p}{2c}+\frac{bu}{2c}+\frac{\nu}{2}-\frac{bs}{c},\nu;\frac{p}{2c}+\frac{bu}{2c}+\frac{\nu}{2}-\frac{bs}{c}+1;-e^{2cz}\right)}{p+b(u-2s)+c\nu}+\right.$$
$$\left.\frac{e^{(p-b(u-2s))z}\,{}_2F_1\left(\frac{p}{2c}+\frac{bs}{c}+\frac{\nu}{2}-\frac{bu}{2c},\nu;\frac{p}{2c}+\frac{bs}{c}+\frac{\nu}{2}-\frac{bu}{2c}+1;-e^{2cz}\right)}{p-b(u-2s)+c\nu}\right)+2^{-m-u}\left(1+e^{2cz}\right)^\nu\operatorname{sech}^\nu(cz)$$
$$\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\binom{u}{s}\left(\left(e^{(ai(m-2k)+p+b(u-2s))z}\,{}_2F_1\left(-\frac{iak}{c}+\frac{iam}{2c}+\frac{p}{2c}+\frac{bu}{2c}+\frac{\nu}{2}-\frac{bs}{c},\nu;-\frac{iak}{c}+\frac{iam}{2c}+\right.\right.\right.$$
$$\left.\left.\frac{p}{2c}+\frac{bu}{2c}+\frac{\nu}{2}-\frac{bs}{c}+1;-e^{2cz}\right)\right)\Big/(ai(m-2k)+p+b(u-2s)+c\nu)+\left(e^{(-ia(m-2k)+p+b(u-2s))z}\right.$$
$$\left.{}_2F_1\left(\frac{iak}{c}+\frac{p}{2c}+\frac{bu}{2c}+\frac{\nu}{2}-\frac{bs}{c}-\frac{iam}{2c},\nu;\frac{iak}{c}+\frac{p}{2c}+\frac{bu}{2c}+\frac{\nu}{2}-\frac{bs}{c}-\frac{iam}{2c}+1;-e^{2cz}\right)\right)\Big/$$
$$(-ia(m-2k)+p+b(u-2s)+c\nu)+\left(e^{(ai(m-2k)+p-b(u-2s))z}\,{}_2F_1\left(-\frac{iak}{c}+\frac{iam}{2c}+\frac{p}{2c}+\frac{bs}{c}+\frac{\nu}{2}-\frac{bu}{2c},\right.\right.$$
$$\left.\left.\nu;-\frac{iak}{c}+\frac{iam}{2c}+\frac{p}{2c}+\frac{bs}{c}+\frac{\nu}{2}-\frac{bu}{2c}+1;-e^{2cz}\right)\right)\Big/(ai(m-2k)+p-b(u-2s)+c\nu)+$$
$$\left(e^{(-ia(m-2k)+p-b(u-2s))z}\,{}_2F_1\left(\frac{iak}{c}+\frac{p}{2c}+\frac{bs}{c}+\frac{\nu}{2}-\frac{iam}{2c}-\frac{bu}{2c},\nu;\frac{iak}{c}+\frac{p}{2c}+\frac{bs}{c}+\frac{\nu}{2}-\frac{iam}{2c}-\frac{bu}{2c}+1;\right.\right.$$
$$\left.\left.\left.-e^{2cz}\right)\right)\Big/(-ia(m-2k)+p-b(u-2s)+c\nu)\right)\;/;\;m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

01.24.21.0574.01

$$\int e^{p z} \cos^m(a z) \cosh^{\mu}(c z) \operatorname{sech}^{\nu}(c z)\, dz = \frac{1}{p + c(\nu - \mu)} 2^{-m} e^{p z} \left(1 + e^{2 c z}\right)^{\nu-\mu} \binom{m}{\frac{m}{2}} {}_2F_1\left(\frac{p - c\mu + c\nu}{2c}, \nu - \mu; \frac{p + c(-\mu + \nu + 2)}{2c}; -e^{2 c z}\right) (1 - m \bmod 2) \operatorname{sech}^{\nu}(c z) \cosh^{\mu}(c z) + 2^{-m} \left(1 + e^{2 c z}\right)^{\nu-\mu} \operatorname{sech}^{\nu}(c z) \cosh^{\mu}(c z) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left( \frac{e^{(p - i a (m - 2k)) z} {}_2F_1\left(\frac{-i a (m-2k) + p - c\mu + c\nu}{2c}, \nu - \mu; \frac{-i a (m-2k) + p + c(-\mu + \nu + 2)}{2c}; -e^{2 c z}\right)}{-i a (m - 2k) + p + c(\nu - \mu)} + \frac{e^{(a i (m-2k) + p) z} {}_2F_1\left(\frac{a i (m-2k) + p - c\mu + c\nu}{2c}, \nu - \mu; \frac{a i (m-2k) + p + c(-\mu + \nu + 2)}{2c}; -e^{2 c z}\right)}{a i (m - 2k) + p + c(\nu - \mu)} \right) /; m \in \mathbb{N}^+$$

## Involving sin, tanh and exp

### Involving $e^{p z} \sin(a z) \tanh(c z) \operatorname{sech}^{\nu}(c z)$

01.24.21.0575.01

$$\int e^{p z} \sin(a z) \tanh(c z) \operatorname{sech}^{\nu}(c z)\, dz = \frac{1}{4} \left(1 + e^{2 c z}\right)^{\nu+1} \operatorname{sech}^{\nu+1}(c z) \left( -\frac{e^{-\frac{1}{2}(i\pi) + (-c + i a + p) z} {}_2F_1\left(\frac{i a}{2c} + \frac{p}{2c} + \frac{\nu}{2}, \nu + 1; 1 + \frac{i a}{2c} + \frac{p}{2c} + \frac{\nu}{2}; -e^{2 c z}\right)}{i a + p + c\nu} + \frac{e^{-\frac{1}{2}(i\pi) + (c + i a + p) z} {}_2F_1\left(1 + \frac{i a}{2c} + \frac{p}{2c} + \frac{\nu}{2}, \nu + 1; 2 + \frac{i a}{2c} + \frac{p}{2c} + \frac{\nu}{2}; -e^{2 c z}\right)}{i a + p + c(\nu + 2)} - \frac{e^{\frac{i\pi}{2} + (-c - i a + p) z} {}_2F_1\left(-\frac{i a}{2c} + \frac{p}{2c} + \frac{\nu}{2}, \nu + 1; 1 - \frac{i a}{2c} + \frac{p}{2c} + \frac{\nu}{2}; -e^{2 c z}\right)}{-i a + p + c\nu} + \frac{e^{\frac{i\pi}{2} + (c - i a + p) z} {}_2F_1\left(1 - \frac{i a}{2c} + \frac{p}{2c} + \frac{\nu}{2}, \nu + 1; 2 - \frac{i a}{2c} + \frac{p}{2c} + \frac{\nu}{2}; -e^{2 c z}\right)}{-i a + p + c(\nu + 2)} \right)$$

## Involving powers of sin, powers of tanh and exp

### Involving $e^{p z} \sin^m(a z) \tanh^{\mu}(c z) \operatorname{sech}^{\nu}(c z)$

01.24.21.0576.01

$$\int e^{p z} \sin^m(a z) \tanh^\mu(c z) \operatorname{sech}^\nu(c z)\, dz = 2^{-m} \left(1+e^{-2 c z}\right)^{\mu+\nu} \operatorname{sech}^\nu(c z) \left(\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left(\left(e^{\frac{i \pi m}{2}+(p-i a (m-2 k)) z} F_1\left(-\frac{-i a (m-2 k)+p-c \nu}{2 c}; \mu+\nu, -\mu; \frac{1}{2}\left(-\frac{p-i a (m-2 k)}{c}+\nu+2\right); -e^{-2 c z}, e^{-2 c z}\right)\right) \Big/ (-i a (m-2 k)+p-c \nu) + \frac{1}{a i (m-2 k)+p-c \nu} \left(e^{(a i (m-2 k)+p) z-\frac{i m \pi}{2}} F_1\left(-\frac{a i (m-2 k)+p-c \nu}{2 c}; \mu+\nu, -\mu; \frac{1}{2}\left(-\frac{a i (m-2 k)+p}{c}+\nu+2\right); -e^{-2 c z}, e^{-2 c z}\right)\right)\right)\right) \tanh^\mu(c z) \left(1-e^{-2 c z}\right)^{-\mu} + \frac{1}{p-c \nu} \left(2^{-m} e^{p z} \left(1-e^{-2 c z}\right)^{-\mu} \left(1+e^{-2 c z}\right)^{\mu+\nu} F_1\left(-\frac{p-c \nu}{2 c}; \mu+\nu, -\mu; \frac{1}{2}\left(-\frac{p}{c}+\nu+2\right); -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} (1-m \bmod 2) \operatorname{sech}^\nu(c z) \tanh^\mu(c z)\right) /; m \in \mathbb{N}^+$$

01.24.21.0577.01

$$\int e^{p z} \sin^m(a z) \tanh^u(c z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{p+c(u+\nu)} \left(i^u 2^{-m-u} e^{p z} \left(1+e^{2 c z}\right)^{u+\nu} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} {}_2F_1\!\left(\frac{p}{2c}+\frac{u}{2}+\frac{\nu}{2}, u+\nu; \frac{p}{2c}+\frac{u}{2}+\frac{\nu}{2}+1; -e^{2cz}\right) (1-m \bmod 2)(1-u \bmod 2) \operatorname{sech}^{u+\nu}(c z)\right) + \left(\frac{i}{2}\right)^{m+u} \left(1+e^{2cz}\right)^{u+\nu} \binom{u}{\frac{u}{2}} (1-u \bmod 2) \operatorname{sech}^{u+\nu}(cz) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left(\left((-1)^m e^{(a i (m-2k)+p) z}\, {}_2F_1\!\left(-\frac{i a k}{c}+\frac{i a m}{2c}+\frac{p}{2c}+\frac{u}{2}+\frac{\nu}{2}, u+\nu; -\frac{i a k}{c}+\frac{i a m}{2c}+\frac{p}{2c}+\frac{u}{2}+\frac{\nu}{2}+1; -e^{2cz}\right)\right) \Big/ (a i (m-2k)+p+c(u+\nu)) + \left(e^{(p-i a (m-2k)) z}\, {}_2F_1\!\left(\frac{i a k}{c}+\frac{p}{2c}+\frac{u}{2}+\frac{\nu}{2}-\frac{i a m}{2c}, u+\nu; \frac{i a k}{c}+\frac{p}{2c}+\frac{u}{2}+\frac{\nu}{2}-\frac{i a m}{2c}+1; -e^{2cz}\right)\right) \Big/ (a i (2k-m)+p+c(u+\nu))\right) + 2^{-m-u} \left(1+e^{2cz}\right)^{u+\nu} \binom{m}{\frac{m}{2}} (1-m \bmod 2) \operatorname{sech}^{u+\nu}(cz) \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^s \binom{u}{s} \left(\frac{(-1)^u e^{(p-c(u-2s))z}\, {}_2F_1\!\left(\frac{p}{2c}+s+\frac{\nu}{2}, u+\nu; \frac{p}{2c}+s+\frac{\nu}{2}+1; -e^{2cz}\right)}{p+c(2s+\nu)} + \frac{e^{(p+c(u-2s))z}\, {}_2F_1\!\left(\frac{p}{2c}-s+u+\frac{\nu}{2}, u+\nu; \frac{p}{2c}-s+u+\frac{\nu}{2}+1; -e^{2cz}\right)}{p+c(-2s+2u+\nu)}\right) + 2^{-m-u} \left(1+e^{2cz}\right)^{u+\nu} \operatorname{sech}^{u+\nu}(cz) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^s \binom{u}{s} \left(\left((-1)^u e^{(a i (m-2k)+p-c(u-2s)) z-\frac{i m \pi}{2}}\, {}_2F_1\!\left(-\frac{i a k}{c}+\frac{i a m}{2c}+\frac{p}{2c}+s+\frac{\nu}{2}, u+\nu; -\frac{i a k}{c}+\frac{i a m}{2c}+\frac{p}{2c}+s+\frac{\nu}{2}+1; -e^{2cz}\right)\right) \Big/ (-2 a i k+i a m+p+2 c s+c \nu) + \left((-1)^u e^{\frac{i \pi m}{2}+(-i a (m-2k)+p-c(u-2s)) z}\, {}_2F_1\!\left(\frac{i a k}{c}+\frac{p}{2c}+s+\frac{\nu}{2}-\frac{i a m}{2c}, u+\nu; \frac{i a k}{c}+\frac{p}{2c}+s+\frac{\nu}{2}-\frac{i a m}{2c}+1; -e^{2cz}\right)\right) \Big/ (2 i a k-i a m+p+2 c s+c \nu) + \left(e^{(a i (m-2k)+p+c(u-2s)) z-\frac{i m \pi}{2}}\, {}_2F_1\!\left(-\frac{i a k}{c}+\frac{i a m}{2c}+\frac{p}{2c}-s+u+\frac{\nu}{2}, u+\nu; -\frac{i a k}{c}+\frac{i a m}{2c}+\frac{p}{2c}-s+u+\frac{\nu}{2}+1; -e^{2cz}\right)\right) \Big/ (a i (m-2k)+p+c(-2s+2u+\nu)) + \left(e^{\frac{i \pi m}{2}+(-i a (m-2k)+p+c(u-2s)) z}\, {}_2F_1\!\left(\frac{i a k}{c}+\frac{p}{2c}-s+u+\frac{\nu}{2}-\frac{i a m}{2c}, u+\nu; \frac{i a k}{c}+\frac{p}{2c}-s+u+\frac{\nu}{2}-\frac{i a m}{2c}+1; -e^{2cz}\right)\right) \Big/ (a i (2k-m)+p+c(-2s+2u+\nu))\right) /; m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

## Involving cos, tanh and exp

### Involving $e^{p z} \cos(a z) \tanh(c z) \operatorname{sech}^\nu(c z)$

01.24.21.0578.01

$$\int e^{pz}\cos(az)\tanh(cz)\,\text{sech}^{\nu}(cz)\,dz = \frac{1}{4}\left(1+e^{2cz}\right)^{\nu+1}\text{sech}^{\nu+1}(cz)\left(-\frac{e^{(-c+ia+p)z}\,{}_2F_1\left(\frac{ia}{2c}+\frac{p}{2c}+\frac{\nu}{2},\nu+1;1+\frac{ia}{2c}+\frac{p}{2c}+\frac{\nu}{2};-e^{2cz}\right)}{ia+p+c\nu}+\frac{e^{(c+ia+p)z}\,{}_2F_1\left(1+\frac{ia}{2c}+\frac{p}{2c}+\frac{\nu}{2},\nu+1;2+\frac{ia}{2c}+\frac{p}{2c}+\frac{\nu}{2};-e^{2cz}\right)}{ia+p+c(\nu+2)}-\frac{e^{(-c-ia+p)z}\,{}_2F_1\left(-\frac{ia}{2c}+\frac{p}{2c}+\frac{\nu}{2},\nu+1;1-\frac{ia}{2c}+\frac{p}{2c}+\frac{\nu}{2};-e^{2cz}\right)}{-ia+p+c\nu}+\frac{e^{(c-ia+p)z}\,{}_2F_1\left(1-\frac{ia}{2c}+\frac{p}{2c}+\frac{\nu}{2},\nu+1;2-\frac{ia}{2c}+\frac{p}{2c}+\frac{\nu}{2};-e^{2cz}\right)}{-ia+p+c(\nu+2)}\right)$$

## Involving powers of cos, powers of tanh and exp

### Involving $e^{pz}\cos^m(az)\tanh^{\mu}(cz)\,\text{sech}^{\nu}(cz)$

01.24.21.0579.01

$$\int e^{pz}\cos^m(az)\tanh^{\mu}(cz)\,\text{sech}^{\nu}(cz)\,dz = 2^{-m}\left(1+e^{-2cz}\right)^{\mu+\nu}\text{sech}^{\nu}(cz)\left(\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\left(\left(e^{(p-ia(m-2k))z}F_1\left(-\frac{-ia(m-2k)+p-c\nu}{2c};\mu+\nu,-\mu;\frac{1}{2}\left(-\frac{p-ia(m-2k)}{c}+\nu+2\right);-e^{-2cz},e^{-2cz}\right)\right)\Big/(-ia(m-2k)+p-c\nu)+\frac{1}{ai(m-2k)+p-c\nu}\left(e^{(ai(m-2k)+p)z}F_1\left(-\frac{ai(m-2k)+p-c\nu}{2c};\mu+\nu,-\mu;\frac{1}{2}\left(-\frac{ai(m-2k)+p}{c}+\nu+2\right);-e^{-2cz},e^{-2cz}\right)\right)\right)\right)\tanh^{\mu}(cz)\left(1-e^{-2cz}\right)^{-\mu}+\frac{1}{p-c\nu}\left(2^{-m}e^{pz}\left(1-e^{-2cz}\right)^{-\mu}\left(1+e^{-2cz}\right)^{\mu+\nu}F_1\left(-\frac{p-c\nu}{2c};\mu+\nu,-\mu;\frac{1}{2}\left(-\frac{p}{c}+\nu+2\right);-e^{-2cz},e^{-2cz}\right)\binom{m}{\frac{m}{2}}(1-m\bmod 2)\,\text{sech}^{\nu}(cz)\tanh^{\mu}(cz)\right)\;/;\;m\in\mathbb{N}^+$$

01.24.21.0580.01

$$\int e^{p z} \cos^m(a z) \tanh^u(c z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{p+c(u+\nu)} \left( i^u 2^{-m-u} e^{p z} \left(1+e^{2 c z}\right)^{u+\nu} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} {}_2F_1\left(\frac{p}{2c}+\frac{u}{2}+\frac{\nu}{2}, u+\nu; \frac{p}{2c}+\frac{u}{2}+\frac{\nu}{2}+1; -e^{2 c z}\right) (1-m \bmod 2)(1-u \bmod 2) \operatorname{sech}^{u+\nu}(c z)\right) - i^u 2^{-m-u} \left(1+e^{2 c z}\right)^{u+\nu} \binom{u}{\frac{u}{2}} (u \bmod 2 - 1) \operatorname{sech}^{u+\nu}(c z) \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \left( \left( e^{(p-i a (m-2s)) z} {}_2F_1\left(-\frac{i a m}{2c}+\frac{p}{2c}+\frac{i a s}{c}+\frac{u}{2}+\frac{\nu}{2}, u+\nu; -\frac{i a m}{2c}+\frac{p}{2c}+\frac{i a s}{c}+\frac{u}{2}+\frac{\nu}{2}+1; -e^{2 c z}\right)\right) \Big/ (p - i a (m-2s) + c(u+\nu)) + \left( e^{(p+a i (m-2s)) z} {}_2F_1\left(\frac{i a m}{2c}+\frac{p}{2c}+\frac{u}{2}+\frac{\nu}{2}-\frac{i a s}{c}, u+\nu; \frac{i a m}{2c}+\frac{p}{2c}+\frac{u}{2}+\frac{\nu}{2}-\frac{i a s}{c}+1; -e^{2 c z}\right)\right) \Big/ (p + a i (m-2s) + c(u+\nu)) \right) + 2^{-m-u} \left(1+e^{2 c z}\right)^{u+\nu} \binom{m}{\frac{m}{2}} (1-m \bmod 2) \operatorname{sech}^{u+\nu}(c z) \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{u}{k} \left( \frac{(-1)^u e^{(p-c(u-2k)) z} {}_2F_1\left(k+\frac{p}{2c}+\frac{\nu}{2}, u+\nu; k+\frac{p}{2c}+\frac{\nu}{2}+1; -e^{2 c z}\right)}{p+c(2k+\nu)} + \frac{e^{(p+c(u-2k)) z} {}_2F_1\left(-k+\frac{p}{2c}+u+\frac{\nu}{2}, u+\nu; -k+\frac{p}{2c}+u+\frac{\nu}{2}+1; -e^{2 c z}\right)}{p+c(-2k+2u+\nu)} \right) + 2^{-m-u} \left(1+e^{2 c z}\right)^{u+\nu} \operatorname{sech}^{u+\nu}(c z) \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{s} \binom{u}{k} \left( \left( (-1)^u e^{(p-i a (m-2s) - c(u-2k)) z} {}_2F_1\left(k+\frac{p}{2c}+\frac{i a s}{c}+\frac{\nu}{2}-\frac{i a m}{2c}, u+\nu; k+\frac{p}{2c}+\frac{i a s}{c}+\frac{\nu}{2}-\frac{i a m}{2c}+1; -e^{2 c z}\right)\right) \Big/ (p - i a (m-2s) + c(2k+\nu)) + \left( (-1)^u e^{(p+a i (m-2s) - c(u-2k)) z} {}_2F_1\left(k+\frac{i a m}{2c}+\frac{p}{2c}+\frac{\nu}{2}-\frac{i a s}{c}, u+\nu; k+\frac{i a m}{2c}+\frac{p}{2c}+\frac{\nu}{2}-\frac{i a s}{c}+1; -e^{2 c z}\right)\right) \Big/ (p + a i (m-2s) + c(2k+\nu)) + \left( e^{(p-i a (m-2s) + c(u-2k)) z} {}_2F_1\left(-k+\frac{p}{2c}+\frac{i a s}{c}+u+\frac{\nu}{2}-\frac{i a m}{2c}, u+\nu; -k+\frac{p}{2c}+\frac{i a s}{c}+u+\frac{\nu}{2}-\frac{i a m}{2c}+1; -e^{2 c z}\right)\right) \Big/ (p - i a (m-2s) + c(-2k+2u+\nu)) + \left( e^{(p+a i (m-2s) + c(u-2k)) z} {}_2F_1\left(-k+\frac{i a m}{2c}+\frac{p}{2c}+u+\frac{\nu}{2}-\frac{i a s}{c}, u+\nu; -k+\frac{i a m}{2c}+\frac{p}{2c}+u+\frac{\nu}{2}-\frac{i a s}{c}+1; -e^{2 c z}\right)\right) \Big/ (p + a i (m-2s) + c(-2k+2u+\nu)) \right) /; m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

## Involving sin, coth and exp

### Involving $e^{p z} \sin(a z) \coth(c z) \operatorname{sech}^\nu(c z)$

01.24.21.0581.01

$$\int e^{p z} \sin(a z) \coth(c z) \operatorname{sech}^{\nu}(c z) \, dz = i \left(1 + e^{-2 c z}\right)^{\nu-1} e^{-c z} \left( \frac{e^{(-i a+p) z}}{-i a + p - c \nu} F_1\left(\frac{i a - p + c \nu}{2 c}; \nu - 1, 1; \frac{1}{2} \left(\frac{i a - p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right) + \frac{e^{(i a+p) z}}{-i a - p + c \nu} F_1\left(-\frac{i a + p - c \nu}{2 c}; \nu - 1, 1; \frac{1}{2} \left(-\frac{i a + p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)\right) \operatorname{sech}^{\nu-1}(c z)$$

Involving powers of sin, powers of coth and exp

## Involving $e^{p z} \sin^{m}(a z) \coth^{\mu}(c z) \operatorname{sech}^{\nu}(c z)$

01.24.21.0582.01

$$\int e^{p z} \sin^{m}(a z) \coth^{\mu}(c z) \operatorname{sech}^{\nu}(c z) \, dz = 2^{-m} \left(1 - e^{-2 c z}\right)^{\mu} \left(1 + e^{-2 c z}\right)^{\nu-\mu} \operatorname{sech}^{\nu}(c z) \left( \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^{k} \binom{m}{k} \left( \left( e^{\frac{i \pi m}{2} + (p - i a (m - 2 k)) z} F_1\left(-\frac{-i a (m - 2 k) + p - c \nu}{2 c}; \nu - \mu, \mu; \frac{1}{2} \left(-\frac{p - i a (m - 2 k)}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)\right) \Big/ (-i a (m - 2 k) + p - c \nu) + \frac{1}{a i (m - 2 k) + p - c \nu} \left( e^{(a i (m-2 k)+p) z - \frac{i m \pi}{2}} F_1\left(-\frac{a i (m - 2 k) + p - c \nu}{2 c}; \nu - \mu, \mu; \frac{1}{2} \left(-\frac{a i (m - 2 k) + p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)\right)\right)\right) \coth^{\mu}(c z) + \frac{1}{p - c \nu} \left(2^{-m} e^{p z} \left(1 - e^{-2 c z}\right)^{\mu} \left(1 + e^{-2 c z}\right)^{\nu-\mu} F_1\left(-\frac{p - c \nu}{2 c}; \nu - \mu, \mu; \frac{1}{2} \left(-\frac{p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} \coth^{\mu}(c z) (1 - m \bmod 2) \operatorname{sech}^{\nu}(c z)\right) /; m \in \mathbb{N}^{+}$$

Involving cos, coth and exp

## Involving $e^{p z} \cos(a z) \coth(c z) \operatorname{sech}^{\nu}(c z)$

01.24.21.0583.01

$$\int e^{p z} \cos(a z) \coth(c z) \operatorname{sech}^{\nu}(c z) \, dz = \left(1 + e^{-2 c z}\right)^{\nu-1} e^{-c z} \left( \frac{e^{(-i a+p) z}}{-i a + p - c \nu} F_1\left(\frac{i a - p + c \nu}{2 c}; \nu - 1, 1; \frac{1}{2} \left(\frac{i a - p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right) + \frac{e^{(i a+p) z}}{i a + p - c \nu} F_1\left(-\frac{i a + p - c \nu}{2 c}; \nu - 1, 1; \frac{1}{2} \left(-\frac{i a + p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)\right) \operatorname{sech}^{\nu-1}(c z)$$

Involving powers of cos, powers of coth and exp

## Involving $e^{p z} \cos^m(a z) \coth^\mu(c z) \operatorname{sech}^\nu(c z)$

01.24.21.0584.01

$$\int e^{p z} \cos^m(a z) \coth^\mu(c z) \operatorname{sech}^\nu(c z)\, dz = 2^{-m} \left(1 - e^{-2 c z}\right)^\mu \left(1 + e^{-2 c z}\right)^{\nu-\mu} \operatorname{sech}^\nu(c z)$$
$$\left(\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left(\left(e^{(p - i a (m-2k)) z} F_1\left(-\frac{-i a (m-2k) + p - c \nu}{2 c}; \nu-\mu, \mu; \frac{1}{2}\left(-\frac{p - i a (m-2k)}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)\right) \middle/ \right.\right.$$
$$(-i a (m-2k) + p - c \nu) + \frac{1}{a i (m-2k) + p - c \nu}$$
$$\left.\left.\left(e^{(a i (m-2k) + p) z} F_1\left(-\frac{a i (m-2k) + p - c \nu}{2 c}; \nu-\mu, \mu; \frac{1}{2}\left(-\frac{a i (m-2k) + p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)\right)\right)\right)$$
$$\coth^\mu(c z) + \frac{1}{p - c \nu}\left(2^{-m} e^{p z} \left(1 - e^{-2 c z}\right)^\mu \left(1 + e^{-2 c z}\right)^{\nu-\mu} F_1\left(-\frac{p - c \nu}{2 c}; \nu-\mu, \mu; \frac{1}{2}\left(-\frac{p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)\right.$$
$$\left.\binom{m}{\frac{m}{2}} \coth^\mu(c z) (1 - m \bmod 2) \operatorname{sech}^\nu(c z)\right) /; m \in \mathbb{N}^+$$

Involving sin, csch and exp

## Involving $e^{p z} \sin(a z) \operatorname{csch}(c z) \operatorname{sech}^\nu(c z)$

01.24.21.0585.01

$$\int e^{p z} \sin(a z) \operatorname{csch}(c z) \operatorname{sech}^\nu(c z)\, dz =$$
$$-i \left(1 + e^{-2 c z}\right)^\nu e^{-c z} \left(\frac{e^{(i a + p) z}}{i a + p - c (\nu + 1)} F_1\left(\frac{\nu c + c - i a - p}{2 c}; \nu, 1; -\frac{i a + p - c (\nu + 3)}{2 c}; -e^{-2 c z}, e^{-2 c z}\right) + \right.$$
$$\left.\frac{e^{(-i a + p) z}}{\nu c + c + i a - p} F_1\left(\frac{\nu c + c + i a - p}{2 c}; \nu, 1; \frac{i a - p + c (\nu + 3)}{2 c}; -e^{-2 c z}, e^{-2 c z}\right)\right) \operatorname{sech}^\nu(c z)$$

Involving powers of sin, powers of csch and exp

## Involving $e^{p z} \sin^m(a z) \operatorname{csch}^\mu(c z) \operatorname{sech}^\nu(c z)$

01.24.21.0586.01

$$\int e^{p z} \sin^m(a z) \operatorname{csch}^{\mu}(c z) \operatorname{sech}^{\nu}(c z)\, dz = 2^{-m} \left(1 - e^{-2 c z}\right)^{\mu} \left(1 + e^{-2 c z}\right)^{\nu} \operatorname{sech}^{\nu}(c z) \left( \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left( \left( e^{(a i (m-2k)+p) z - \frac{i m \pi}{2}} F_1\left( \frac{-i a (m-2k) - p + c(\mu+\nu)}{2c}; \nu, \mu; \frac{-i a (m-2k) - p + c(\mu+\nu+2)}{2c}; -e^{-2 c z}, e^{-2 c z} \right) \right) \Big/ (a i (m-2k) + p - c(\mu+\nu)) + \left( e^{\frac{i \pi m}{2} + (p - i a (m-2k)) z} F_1\left( \frac{a i (m-2k) - p + c(\mu+\nu)}{2c}; \nu, \mu; \frac{a i (m-2k) - p + c(\mu+\nu+2)}{2c}; -e^{-2 c z}, e^{-2 c z} \right) \right) \Big/ (-i a (m-2k) + p - c(\mu+\nu)) \right) \right) \operatorname{csch}^{\mu}(c z) + \frac{1}{p - c(\mu+\nu)} \left( 2^{-m} e^{p z} \left(1 - e^{-2 c z}\right)^{\mu} \left(1 + e^{-2 c z}\right)^{\nu} F_1\left( \frac{c(\mu+\nu) - p}{2c}; \nu, \mu; \frac{c(\mu+\nu+2) - p}{2c}; -e^{-2 c z}, e^{-2 c z} \right) \binom{m}{\frac{m}{2}} \operatorname{csch}^{\mu}(c z) (1 - m \bmod 2) \operatorname{sech}^{\nu}(c z) \right) /; m \in \mathbb{N}^+$$

## Involving cos, csch and exp

### Involving $e^{p z} \cos(a z) \operatorname{csch}(c z) \operatorname{sech}^{\nu}(c z)$

01.24.21.0587.01

$$\int e^{p z} \cos(a z) \operatorname{csch}(c z) \operatorname{sech}^{\nu}(c z)\, dz = \left(1 + e^{-2 c z}\right)^{\nu} e^{-c z} \left( \frac{e^{(i a + p) z}}{i a + p - c(\nu+1)} F_1\left( \frac{\nu c + c - i a - p}{2c}; \nu, 1; -\frac{i a + p - c(\nu+3)}{2c}; -e^{-2 c z}, e^{-2 c z} \right) + \frac{e^{(-i a + p) z}}{-i a + p - c(\nu+1)} F_1\left( \frac{\nu c + c + i a - p}{2c}; \nu, 1; \frac{i a - p + c(\nu+3)}{2c}; -e^{-2 c z}, e^{-2 c z} \right) \right) \operatorname{sech}^{\nu}(c z)$$

## Involving powers of cos, powers of csch and exp

### Involving $e^{p z} \cos^m(a z) \operatorname{csch}^{\mu}(c z) \operatorname{sech}^{\nu}(c z)$

01.24.21.0588.01

$$\int e^{p z} \cos^m(a z) \operatorname{csch}^\mu(c z) \operatorname{sech}^\nu(c z)\, dz = 2^{-m} \left(1 - e^{-2 c z}\right)^\mu \left(1 + e^{-2 c z}\right)^\nu \operatorname{sech}^\nu(c z) \left(\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left(\left(e^{(a i (m-2k)+p) z} F_1\left(\frac{-i a (m-2k) - p + c(\mu+\nu)}{2c}; \nu, \mu; \frac{-i a (m-2k) - p + c(\mu+\nu+2)}{2c}; -e^{-2 c z}, e^{-2 c z}\right)\right) \Big/ (a i (m-2k) + p - c(\mu+\nu)) + \left(e^{(p - i a (m-2k)) z} F_1\left(\frac{a i (m-2k) - p + c(\mu+\nu)}{2c}; \nu, \mu; \frac{a i (m-2k) - p + c(\mu+\nu+2)}{2c}; -e^{-2 c z}, e^{-2 c z}\right)\right) \Big/ (-i a (m-2k) + p - c(\mu+\nu))\right)\right) \operatorname{csch}^\mu(c z) + \frac{1}{p - c(\mu+\nu)} \left(2^{-m} e^{p z} \left(1 - e^{-2 c z}\right)^\mu \left(1 + e^{-2 c z}\right)^\nu F_1\left(\frac{c(\mu+\nu) - p}{2c}; \nu, \mu; \frac{c(\mu+\nu+2) - p}{2c}; -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} \operatorname{csch}^\mu(c z) (1 - m \bmod 2) \operatorname{sech}^\nu(c z)\right) /; m \in \mathbb{N}^+$$

**Involving functions of the direct function, hyperbolic, trigonometric and a power functions**

## Involving powers of the direct function, hyperbolic, trigonometric and a power functions

### Involving sin, sinh and power

### Involving $z^n \sin(a z) \sinh(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0589.01

$$\int z^n \sin(a z) \sinh(b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{4} \left(1 + e^{2 c z}\right)^\nu n! \operatorname{sech}^\nu(c z) \left(-e^{\frac{i \pi}{2} + (-b - i a) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (-b - i a + c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c \nu - i a - b}{2c}, \ldots, \frac{c \nu - i a - b}{2c}, \nu; \frac{c \nu - i a - b}{2c} + 1, \ldots, \frac{c \nu - i a - b}{2c} + 1; -e^{2 c z}\right) + e^{-\frac{1}{2}(i \pi) + (b + i a) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (b + i a + c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c \nu + i a + b}{2c}, \ldots, \frac{c \nu + i a + b}{2c}, \nu; \frac{c \nu + i a + b}{2c} + 1, \ldots, \frac{c \nu + i a + b}{2c} + 1; -e^{2 c z}\right) - e^{-\frac{1}{2}(i \pi) + (b - i a) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (b - i a + c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c \nu - i a + b}{2c}, \ldots, \frac{c \nu - i a + b}{2c}, \nu; \frac{c \nu - i a + b}{2c} + 1, \ldots, \frac{c \nu - i a + b}{2c} + 1; -e^{2 c z}\right) + e^{\frac{i \pi}{2} + (-b + i a) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (-b + i a + c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c \nu + i a - b}{2c}, \ldots, \frac{c \nu + i a - b}{2c}, \nu; \frac{c \nu + i a - b}{2c} + 1, \ldots, \frac{c \nu + i a - b}{2c} + 1; -e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

## Involving powers of sin, powers of sinh and power

### Involving $z^n \sin^m(a z) \sinh^u(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0590.01

$$\int z^n \sin^m(a z) \sinh^u(b z) \operatorname{sech}^\nu(c z)\, dz = i^u\, 2^{-m-u} \left(1+e^{2 c z}\right)^\nu \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n!\, (1 - m \bmod 2)$$
$$(1 - u \bmod 2) \operatorname{sech}^\nu(c z) \sum_{j=0}^n \frac{(-1)^j z^{n-j} (c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{\nu}{2}, \ldots, \frac{\nu}{2}, \nu; \frac{\nu}{2}+1, \ldots, \frac{\nu}{2}+1; -e^{2 c z}\right) +$$
$$\left(\frac{i}{2}\right)^{m+u} \binom{u}{\frac{u}{2}} (1 - u \bmod 2)\, n! \operatorname{sech}^\nu(c z) \left(1+e^{2 c z}\right)^\nu$$
$$\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left(e^{(-i a (m-2k)) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (a i (2k-m) + c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{a i (2k-m)+c\nu}{2c}, \ldots, \frac{a i (2k-m)+c\nu}{2c},\right.\right.$$
$$\left.\nu; \frac{a i (2k-m)+c\nu}{2c}+1, \ldots, \frac{a i (2k-m)+c\nu}{2c}+1; -e^{2 c z}\right) + (-1)^m e^{(a i (m-2k)) z}$$
$$\sum_{j=0}^n \frac{(-1)^j z^{n-j} (a i (m-2k) + c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{a i (m-2k)+c\nu}{2c}, \ldots, \frac{a i (m-2k)+c\nu}{2c}, \nu;\right.$$
$$\left.\left.\frac{a i (m-2k)+c\nu}{2c}+1, \ldots, \frac{a i (m-2k)+c\nu}{2c}+1; -e^{2 c z}\right)\right) +$$
$$2^{-m-u} \binom{m}{\frac{m}{2}} (1 - m \bmod 2) \left(1+e^{2 c z}\right)^\nu n! \operatorname{sech}^\nu(c z) \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^s \binom{u}{s} \left((-1)^u e^{(-b (u-2s)) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (-b (u-2s) + c\nu)^{-j-1}}{(n-j)!}\right.$$
$${}_{j+2}F_{j+1}\left(\frac{b (2s-u)+c\nu}{2c}, \ldots, \frac{b (2s-u)+c\nu}{2c}, \nu; \frac{b (2s-u)+c\nu}{2c}+1, \ldots, \frac{b (2s-u)+c\nu}{2c}+1; -e^{2 c z}\right) +$$
$$e^{(b (u-2s)) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (b (u-2s) + c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{b (u-2s)+c\nu}{2c}, \ldots, \frac{b (u-2s)+c\nu}{2c}, \nu;\right.$$
$$\left.\left.\frac{b (u-2s)+c\nu}{2c}+1, \ldots, \frac{b (u-2s)+c\nu}{2c}+1; -e^{2 c z}\right)\right) + 2^{-m-u} \left(1+e^{2 c z}\right)^\nu n! \operatorname{sech}^\nu(c z)$$
$$\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^s \binom{u}{s} \left((-1)^u e^{\frac{i \pi m}{2} + (-i a (m-2k) - b (u-2s)) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (-i a (m-2k) - b (u-2s) + c\nu)^{-j-1}}{(n-j)!}\right.$$
$${}_{j+2}F_{j+1}\left(\frac{2 i a k - i a m + 2 b s - b u + c\nu}{2c}, \ldots, \frac{2 i a k - i a m + 2 b s - b u + c\nu}{2c}, \nu;\right.$$
$$\left.\frac{2 i a k - i a m + 2 b s - b u + c\nu}{2c}+1, \ldots, \frac{2 i a k - i a m + 2 b s - b u + c\nu}{2c}+1; -e^{2 c z}\right) +$$
$$(-1)^u e^{(a i (m-2k) - b (u-2s)) z - \frac{i m \pi}{2}} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (a i (m-2k) - b (u-2s) + c\nu)^{-j-1}}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\left(\frac{a\,i\,(m-2k)+b\,(2s-u)+c\,v}{2c},\,\ldots,\,\frac{a\,i\,(m-2k)+b\,(2s-u)+c\,v}{2c},\,v;\right.$$
$$\left.\frac{a\,i\,(m-2k)+b\,(2s-u)+c\,v}{2c}+1,\,\ldots,\,\frac{a\,i\,(m-2k)+b\,(2s-u)+c\,v}{2c}+1;\,-e^{2cz}\right)+$$
$$e^{\frac{i\pi m}{2}+(-i\,a\,(m-2k)+b\,(u-2s))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(-i\,a\,(m-2k)+b\,(u-2s)+c\,v)^{-j-1}}{(n-j)!}$$
$$ {}_{j+2}F_{j+1}\left(\frac{-i\,a\,(m-2k)+b\,(u-2s)+c\,v}{2c},\,\ldots,\,\frac{-i\,a\,(m-2k)+b\,(u-2s)+c\,v}{2c},\,v;\right.$$
$$\left.\frac{-i\,a\,(m-2k)+b\,(u-2s)+c\,v}{2c}+1,\,\ldots,\,\frac{-i\,a\,(m-2k)+b\,(u-2s)+c\,v}{2c}+1;\,-e^{2cz}\right)+$$
$$e^{(a\,i\,(m-2k)+b\,(u-2s))\,z-\frac{i\,m\pi}{2}}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(a\,i\,(m-2k)+b\,(u-2s)+c\,v)^{-j-1}}{(n-j)!}$$
$$ {}_{j+2}F_{j+1}\left(\frac{a\,i\,(m-2k)+b\,(u-2s)+c\,v}{2c},\,\ldots,\,\frac{a\,i\,(m-2k)+b\,(u-2s)+c\,v}{2c},\,v;\right.$$
$$\frac{a\,i\,(m-2k)+b\,(u-2s)+c\,v}{2c}+1,\,\ldots,\,\frac{a\,i\,(m-2k)+b\,(u-2s)+c\,v}{2c}+$$
$$\left.\left.1;\,-e^{2cz}\right)\right)\,/;\,n\in\mathbb{N}\bigwedge m\in\mathbb{N}^+\bigwedge u\in\mathbb{N}^+$$

Involving cos, sinh and power

### Involving $z^n\cos(a\,z)\sinh(b\,z)\operatorname{sech}^v(c\,z)$

01.24.21.0591.01

$$\int z^n \cos(a z) \sinh(b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{4} i \left(1+e^{2 c z}\right)^\nu n! \operatorname{sech}^\nu(c z) \left(e^{\frac{i\pi}{2}+(-b-i a) z} \sum_{j=0}^n \frac{\left((-1)^j z^{n-j} (-b-i a+c \nu)^{-j-1}\right)}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{-i a-b+c \nu}{2 c}, \ldots, \frac{-i a-b+c \nu}{2 c}, \nu; \frac{-i a-b+c \nu}{2 c}+1, \ldots, \frac{-i a-b+c \nu}{2 c}+1; -e^{2 c z}\right) + e^{\frac{i\pi}{2}+(i a-b) z} \sum_{j=0}^n \frac{\left((-1)^j z^{n-j} (-b+i a+c \nu)^{-j-1}\right)}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a-b+c \nu}{2 c}, \ldots, \frac{i a-b+c \nu}{2 c}, \nu; \frac{i a-b+c \nu}{2 c}+1, \ldots, \frac{i a-b+c \nu}{2 c}+1; -e^{2 c z}\right) + e^{-\frac{1}{2}(i\pi)+(b-i a) z} \sum_{j=0}^n \frac{\left((-1)^j z^{n-j} (b-i a+c \nu)^{-j-1}\right)}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{-i a+b+c \nu}{2 c}, \ldots, \frac{-i a+b+c \nu}{2 c}, \nu; \frac{-i a+b+c \nu}{2 c}+1, \ldots, \frac{-i a+b+c \nu}{2 c}+1; -e^{2 c z}\right) + e^{-\frac{1}{2}(i\pi)+(b+i a) z} \sum_{j=0}^n \frac{\left((-1)^j z^{n-j} (b+i a+c \nu)^{-j-1}\right)}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a+b+c \nu}{2 c}, \ldots, \frac{i a+b+c \nu}{2 c}, \nu; \frac{i a+b+c \nu}{2 c}+1, \ldots, \frac{i a+b+c \nu}{2 c}+1; -e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

## Involving powers of cos, powers of sinh and power

### Involving $z^n \cos^m(a z) \sinh^u(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0592.01

$$\int z^n \cos^m(a z) \sinh^u(b z) \operatorname{sech}^\nu(c z)\, dz = i^u 2^{-m-u} \left(1+e^{2 c z}\right)^\nu \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! (1-m \bmod 2) (1-u \bmod 2) \operatorname{sech}^\nu(c z) \sum_{j=0}^n \frac{(-1)^j z^{n-j} (c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{\nu}{2}, \ldots, \frac{\nu}{2}, \nu; \frac{\nu}{2}+1, \ldots, \frac{\nu}{2}+1; -e^{2 c z}\right) - i^u 2^{-m-u} \binom{u}{\frac{u}{2}} (u \bmod 2-1) n! \operatorname{sech}^\nu(c z) \left(1+e^{2 c z}\right)^\nu \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \left(e^{(a i (m-2 s)) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (a i (m-2 s)+c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{a i (m-2 s)+c \nu}{2 c}, \ldots, \frac{a i (m-2 s)+c \nu}{2 c}, \nu; \frac{a i (m-2 s)+c \nu}{2 c}+1, \ldots, \frac{a i (m-2 s)+c \nu}{2 c}+1; -e^{2 c z}\right) + e^{(-i a (m-2 s)) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (-i a (m-2 s)+c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{-i a (m-2 s)+c \nu}{2 c}, \ldots, \frac{-i a (m-2 s)+c \nu}{2 c}, \nu; \frac{-i a (m-2 s)+c \nu}{2 c}+1, \ldots, \frac{-i a (m-2 s)+c \nu}{2 c}+1; -e^{2 c z}\right)\right) + i^u 2^{-m-u} \binom{m}{\frac{m}{2}} (1-m \bmod 2) n! \operatorname{sech}^\nu(c z) \left(1+e^{2 c z}\right)^\nu \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{u}{k} \left(e^{(b (u-2 k)) z-\frac{i \pi u}{2}} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (b (u-2 k)+c \nu)^{-j-1}}{(n-j)!}\right.$$

$$ {}_{j+2}F_{j+1}\left(\frac{b\,(u-2\,k)+c\,\nu}{2\,c},\,\ldots,\,\frac{b\,(u-2\,k)+c\,\nu}{2\,c},\,\nu;\,\frac{b\,(u-2\,k)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{b\,(u-2\,k)+c\,\nu}{2\,c}+1;\,-e^{2\,c\,z}\right)+ e^{\frac{i\,\pi\,u}{2}+(-b\,(u-2\,k))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(-b\,(u-2\,k)+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{-b\,(u-2\,k)+c\,\nu}{2\,c},\,\ldots,\,\frac{-b\,(u-2\,k)+c\,\nu}{2\,c},\,\nu;\,\frac{-b\,(u-2\,k)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{-b\,(u-2\,k)+c\,\nu}{2\,c}+1;\,-e^{2\,c\,z}\right)\Bigg)+i^u\,2^{-m-u}\,n!\,\mathrm{sech}^{\nu}(c\,z)\left(1+e^{2\,c\,z}\right)^{\nu} $$

$$ \sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{s}\binom{u}{k}\Bigg(e^{\frac{i\,\pi\,u}{2}+(-i\,a\,(m-2\,s)-b\,(u-2\,k))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(-i\,a\,(m-2\,s)-b\,(u-2\,k)+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{-i\,a\,(m-2\,s)-b\,(u-2\,k)+c\,\nu}{2\,c},\,\ldots,\,\frac{-i\,a\,(m-2\,s)-b\,(u-2\,k)+c\,\nu}{2\,c},\,\nu;\,\frac{-i\,a\,(m-2\,s)-b\,(u-2\,k)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{-i\,a\,(m-2\,s)-b\,(u-2\,k)+c\,\nu}{2\,c}+1;\,-e^{2\,c\,z}\right)+ e^{(a\,i\,(m-2\,s)+b\,(u-2\,k))\,z-\frac{i\,\pi\,u}{2}}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(a\,i\,(m-2\,s)+b\,(u-2\,k)+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{a\,i\,(m-2\,s)+b\,(u-2\,k)+c\,\nu}{2\,c},\,\ldots,\,\frac{a\,i\,(m-2\,s)+b\,(u-2\,k)+c\,\nu}{2\,c},\,\nu;\,\frac{a\,i\,(m-2\,s)+b\,(u-2\,k)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{a\,i\,(m-2\,s)+b\,(u-2\,k)+c\,\nu}{2\,c}+1;\,-e^{2\,c\,z}\right)+ e^{(-i\,a\,(m-2\,s)+b\,(u-2\,k))\,z-\frac{i\,\pi\,u}{2}}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(-i\,a\,(m-2\,s)+b\,(u-2\,k)+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{-i\,a\,(m-2\,s)+b\,(u-2\,k)+c\,\nu}{2\,c},\,\ldots,\,\frac{-i\,a\,(m-2\,s)+b\,(u-2\,k)+c\,\nu}{2\,c},\,\nu;\,\frac{-i\,a\,(m-2\,s)+b\,(u-2\,k)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{-i\,a\,(m-2\,s)+b\,(u-2\,k)+c\,\nu}{2\,c}+1;\,-e^{2\,c\,z}\right)+ e^{\frac{i\,\pi\,u}{2}+(a\,i\,(m-2\,s)-b\,(u-2\,k))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(a\,i\,(m-2\,s)-b\,(u-2\,k)+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{a\,i\,(m-2\,s)-b\,(u-2\,k)+c\,\nu}{2\,c},\,\ldots,\,\frac{a\,i\,(m-2\,s)-b\,(u-2\,k)+c\,\nu}{2\,c},\,\nu;\,\frac{a\,i\,(m-2\,s)-b\,(u-2\,k)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{a\,i\,(m-2\,s)-b\,(u-2\,k)+c\,\nu}{2\,c}+1;\,-e^{2\,c\,z}\right)\Bigg)\Bigg)\,/;\,n\in\mathbb{N}\land m\in\mathbb{N}^+\land u\in\mathbb{N}^+ $$

Involving sin, cosh and power

## Involving $z^n \sin(a\,z)\cosh(b\,z)\,\mathrm{sech}^{\nu}(c\,z)$

01.24.21.0593.01

$$\int z^n \sin(a z) \cosh(b z) \operatorname{sech}^\nu(c z) \, dz = \frac{1}{4} \left(1 + e^{2cz}\right)^\nu n! \operatorname{sech}^\nu(c z) \left( e^{\frac{i\pi}{2} + (-b - i a) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (-b - i a + c\nu)^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{-i a - b + c\nu}{2c}, \ldots, \frac{-i a - b + c\nu}{2c}, \nu; \frac{-i a - b + c\nu}{2c} + 1, \ldots, \frac{-i a - b + c\nu}{2c} + 1; -e^{2cz} \right) - e^{\frac{i\pi}{2} + (i a - b) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (-b + i a + c\nu)^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{i a - b + c\nu}{2c}, \ldots, \frac{i a - b + c\nu}{2c}, \nu; \frac{i a - b + c\nu}{2c} + 1, \ldots, \frac{i a - b + c\nu}{2c} + 1; -e^{2cz} \right) - e^{-\frac{1}{2}(i\pi) + (b - i a) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (b - i a + c\nu)^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{-i a + b + c\nu}{2c}, \ldots, \frac{-i a + b + c\nu}{2c}, \nu; \frac{-i a + b + c\nu}{2c} + 1, \ldots, \frac{-i a + b + c\nu}{2c} + 1; -e^{2cz} \right) + e^{-\frac{1}{2}(i\pi) + (b + i a) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (b + i a + c\nu)^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{i a + b + c\nu}{2c}, \ldots, \frac{i a + b + c\nu}{2c}, \nu; \frac{i a + b + c\nu}{2c} + 1, \ldots, \frac{i a + b + c\nu}{2c} + 1; -e^{2cz} \right) \right) /; n \in \mathbb{N}$$

## Involving powers of sin, powers of cosh and power

### Involving $z^n \sin^m(a z) \cosh^u(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0594.01

$$\int z^n \sin^m(a z) \cosh^u(b z) \operatorname{sech}^\nu(c z) \, dz = 2^{-m-u} \left(1 + e^{2cz}\right)^\nu \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! \, (1 - m \bmod 2)(1 - u \bmod 2) \left( \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{\nu}{2}, \ldots, \frac{\nu}{2}, \nu; \frac{\nu}{2} + 1, \ldots, \frac{\nu}{2} + 1; -e^{2cz} \right) \right) \operatorname{sech}^\nu(c z) + 2^{-m-u} \left(1 + e^{2cz}\right)^\nu \binom{u}{\frac{u}{2}} n! \, (1 - u \bmod 2) \left( \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left( e^{(a i (m - 2k)) z - \frac{i m \pi}{2}} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (a i (m - 2k) + c\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{a i (m - 2k) + c\nu}{2c}, \ldots, \frac{a i (m - 2k) + c\nu}{2c}, \nu; \frac{a i (m - 2k) + c\nu}{2c} + 1, \ldots, \frac{a i (m - 2k) + c\nu}{2c} + 1; -e^{2cz} \right) + e^{\frac{i\pi m}{2} + (-i a (m - 2k)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a (m - 2k) + c\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{-i a (m - 2k) + c\nu}{2c}, \ldots, \frac{-i a (m - 2k) + c\nu}{2c}, \nu; \frac{-i a (m - 2k) + c\nu}{2c} + 1, \ldots, \frac{-i a (m - 2k) + c\nu}{2c} + 1; -e^{2cz} \right) \right) \right) \operatorname{sech}^\nu(c z) - 2^{-m-u} \binom{m}{\frac{m}{2}} (m \bmod 2 - 1) \, n! \left(1 + e^{2cz}\right)^\nu \left( \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left( e^{(b (u - 2s)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b (u - 2s) + c\nu)^{-j-1}}{(n-j)!} \right. \right.$$

$$ {}_{j+2}F_{j+1}\left(\frac{b(u-2s)+cv}{2c}, \ldots, \frac{b(u-2s)+cv}{2c}, \nu; \frac{b(u-2s)+cv}{2c}+1, \ldots, \frac{b(u-2s)+cv}{2c}+1; -e^{2cz}\right)+ $$

$$ e^{(-b(u-2s))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(-b(u-2s)+cv)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{-b(u-2s)+cv}{2c}, \ldots, \frac{-b(u-2s)+cv}{2c},\right. $$

$$ \left.\left.\left.\nu; \frac{-b(u-2s)+cv}{2c}+1, \ldots, \frac{-b(u-2s)+cv}{2c}+1; -e^{2cz}\right)\right)\right)\operatorname{sech}^{\nu}(cz)+ $$

$$ 2^{-m-u}\left(1+e^{2cz}\right)^{\nu} n!\left(\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\binom{u}{s}\left(e^{(a i(m-2k)-b(u-2s))z-\frac{i m\pi}{2}}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(a i(m-2k)-b(u-2s)+cv)^{-j-1}}{(n-j)!}\right.\right. $$

$$ {}_{j+2}F_{j+1}\left(\frac{a i(m-2k)+b(2s-u)+cv}{2c}, \ldots, \frac{a i(m-2k)+b(2s-u)+cv}{2c}, \nu;\right. $$

$$ \left.\frac{a i(m-2k)+b(2s-u)+cv}{2c}+1, \ldots, \frac{a i(m-2k)+b(2s-u)+cv}{2c}+1; -e^{2cz}\right)+ $$

$$ e^{\frac{i\pi m}{2}+(-i a(m-2k)+b(u-2s))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(-i a(m-2k)+b(u-2s)+cv)^{-j-1}}{(n-j)!} $$

$$ {}_{j+2}F_{j+1}\left(\frac{-i a(m-2k)+b(u-2s)+cv}{2c}, \ldots, \frac{-i a(m-2k)+b(u-2s)+cv}{2c}, \nu;\right. $$

$$ \left.\frac{-i a(m-2k)+b(u-2s)+cv}{2c}+1, \ldots, \frac{-i a(m-2k)+b(u-2s)+cv}{2c}+1; -e^{2cz}\right)+ $$

$$ e^{\frac{i\pi m}{2}+(-i a(m-2k)-b(u-2s))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(-i a(m-2k)-b(u-2s)+cv)^{-j-1}}{(n-j)!} $$

$$ {}_{j+2}F_{j+1}\left(\frac{2iak-iam+2bs-bu+cv}{2c}, \ldots, \frac{2iak-iam+2bs-bu+cv}{2c}, \nu;\right. $$

$$ \left.\frac{2iak-iam+2bs-bu+cv}{2c}+1, \ldots, \frac{2iak-iam+2bs-bu+cv}{2c}+1; -e^{2cz}\right)+ $$

$$ e^{(a i(m-2k)+b(u-2s))z-\frac{i m\pi}{2}}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(a i(m-2k)+b(u-2s)+cv)^{-j-1}}{(n-j)!} $$

$$ {}_{j+2}F_{j+1}\left(\frac{a i(m-2k)+b(u-2s)+cv}{2c}, \ldots, \frac{a i(m-2k)+b(u-2s)+cv}{2c}, \nu;\right. $$

$$ \frac{a i(m-2k)+b(u-2s)+cv}{2c}+1, \ldots, \frac{a i(m-2k)+b(u-2s)+cv}{2c}+ $$

$$ \left.\left.\left.1; -e^{2cz}\right)\right)\right)\operatorname{sech}^{\nu}(cz)\ /;\ n\in\mathbb{N}\land m\in\mathbb{N}^+\land u\in\mathbb{N}^+ $$

## Involving cos, cosh and power

## Involving $z^n \cos(a z) \cosh(b z) \operatorname{sech}^\nu(c z)$

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$$\int z^n \cos(a z) \cosh(b z) \operatorname{sech}^\nu(c z)\, dz = \frac{i}{4}\left(1+e^{2cz}\right)^\nu n!\, \operatorname{sech}^\nu(c z)\left(-e^{\frac{i\pi}{2}+(-b-i a)z}\sum_{j=0}^n \frac{(-1)^j z^{n-j}(-b-i a+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu-i a-b}{2c},\ldots,\frac{c\nu-i a-b}{2c},\nu;\frac{c\nu-i a-b}{2c}+1,\ldots,\frac{c\nu-i a-b}{2c}+1;-e^{2cz}\right)+e^{-\frac{1}{2}(i\pi)+(b+i a)z}\sum_{j=0}^n \frac{(-1)^j z^{n-j}(b+i a+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu+i a+b}{2c},\ldots,\frac{c\nu+i a+b}{2c},\nu;\frac{c\nu+i a+b}{2c}+1,\ldots,\frac{c\nu+i a+b}{2c}+1;-e^{2cz}\right)+e^{-\frac{1}{2}(i\pi)+(b-i a)z}\sum_{j=0}^n \frac{(-1)^j z^{n-j}(b-i a+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu-i a+b}{2c},\ldots,\frac{c\nu-i a+b}{2c},\nu;\frac{c\nu-i a+b}{2c}+1,\ldots,\frac{c\nu-i a+b}{2c}+1;-e^{2cz}\right)-e^{\frac{i\pi}{2}+(-b+i a)z}\sum_{j=0}^n \frac{(-1)^j z^{n-j}(-b+i a+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu+i a-b}{2c},\ldots,\frac{c\nu+i a-b}{2c},\nu;\frac{c\nu+i a-b}{2c}+1,\ldots,\frac{c\nu+i a-b}{2c}+1;-e^{2cz}\right)\right)\;/;\; n\in\mathbb{N}$$

Involving powers of cos, powers of cosh and power

## Involving $z^n \cos^m(a z) \cosh^u(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0596.01

$$\int z^n \cos^m(a z) \cosh^u(b z) \operatorname{sech}^\nu(c z)\, dz = 2^{-m-u}\left(1+e^{2cz}\right)^\nu \binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}} n!\,(1-m \bmod 2)(1-u \bmod 2)\left(\sum_{j=0}^n \frac{\left((-1)^j z^{n-j}(c\nu)^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{\nu}{2},\ldots,\frac{\nu}{2},\nu;\frac{\nu}{2}+1,\ldots,\frac{\nu}{2}+1;-e^{2cz}\right)\right) \operatorname{sech}^\nu(c z)-2^{-m-u}\binom{u}{\frac{u}{2}}(u \bmod 2-1)\, n!\left(1+e^{2cz}\right)^\nu \left(\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(e^{(-i a(m-2s))z}\sum_{j=0}^n \frac{\left((-1)^j z^{n-j}(c\nu-i a(m-2s))^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu-i a(m-2s)}{2c},\ldots,\frac{c\nu-i a(m-2s)}{2c},\nu;\frac{c\nu-i a(m-2s)}{2c}+1,\ldots,\frac{c\nu-i a(m-2s)}{2c}+1;-e^{2cz}\right)+e^{(i a(m-2s))z}\sum_{j=0}^n \frac{\left((-1)^j z^{n-j}(a\, i(m-2s)+c\nu)^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{i a(m-2s)+c\nu}{2c},\ldots,\frac{i a(m-2s)+c\nu}{2c},\right.\right.\right.$$

$$\left.\left.\left.\nu;\, \frac{i a (m-2 s)+c \nu}{2 c}+1,\, \ldots,\, \frac{i a (m-2 s)+c \nu}{2 c}+1;\, -e^{2 c z}\right)\right)\right) \operatorname{sech}^{\nu}(c z)+$$

$$2^{-m-u} \left(1+e^{2 c z}\right)^{\nu} \binom{m}{\frac{m}{2}} n!\, (1-m \bmod 2) \left(\sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(e^{(-b (u-2 s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c \nu - b (u-2 s))^{-j-1}\right)}{(n-j)!}\right.\right.$$

$$_{j+2}F_{j+1}\left(\frac{c \nu - b (u-2 s)}{2 c}, \ldots, \frac{c \nu - b (u-2 s)}{2 c}, \nu;\, \frac{c \nu - b (u-2 s)}{2 c}+1, \ldots, \frac{c \nu - b (u-2 s)}{2 c}+1;\, -e^{2 c z}\right)+$$

$$e^{(b (u-2 s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (b (u-2 s)+c \nu)^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{b (u-2 s)+c \nu}{2 c}, \ldots, \frac{b (u-2 s)+c \nu}{2 c},\right.$$

$$\left.\left.\left.\nu;\, \frac{b (u-2 s)+c \nu}{2 c}+1, \ldots, \frac{b (u-2 s)+c \nu}{2 c}+1;\, -e^{2 c z}\right)\right)\right) \operatorname{sech}^{\nu}(c z)+$$

$$2^{-m-u} \left(1+e^{2 c z}\right)^{\nu} n! \left(\sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \binom{u}{s} \left(e^{(-i a (m-2 k)-b (u-2 s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (-i a (m-2 k)-b (u-2 s)+c \nu)^{-j-1}\right)}{(n-j)!}\right.\right.$$

$$_{j+2}F_{j+1}\left(\frac{-i a (m-2 k)-b (u-2 s)+c \nu}{2 c}, \ldots, \frac{-i a (m-2 k)-b (u-2 s)+c \nu}{2 c}, \nu;\right.$$

$$\left.\frac{-i a (m-2 k)-b (u-2 s)+c \nu}{2 c}+1, \ldots, \frac{-i a (m-2 k)-b (u-2 s)+c \nu}{2 c}+1;\, -e^{2 c z}\right)+$$

$$e^{(i a (m-2 k)-b (u-2 s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (a i (m-2 k)-b (u-2 s)+c \nu)^{-j-1}\right)}{(n-j)!}$$

$$_{j+2}F_{j+1}\left(\frac{i a (m-2 k)-b (u-2 s)+c \nu}{2 c}, \ldots, \frac{i a (m-2 k)-b (u-2 s)+c \nu}{2 c}, \nu;\right.$$

$$\left.\frac{i a (m-2 k)-b (u-2 s)+c \nu}{2 c}+1, \ldots, \frac{i a (m-2 k)-b (u-2 s)+c \nu}{2 c}+1;\, -e^{2 c z}\right)+$$

$$e^{(b (u-2 s)-i a (m-2 k)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (-i a (m-2 k)+b (u-2 s)+c \nu)^{-j-1}\right)}{(n-j)!}$$

$$_{j+2}F_{j+1}\left(\frac{-i a (m-2 k)+b (u-2 s)+c \nu}{2 c}, \ldots, \frac{-i a (m-2 k)+b (u-2 s)+c \nu}{2 c}, \nu;\right.$$

$$\left.\frac{-i a (m-2 k)+b (u-2 s)+c \nu}{2 c}+1, \ldots, \frac{-i a (m-2 k)+b (u-2 s)+c \nu}{2 c}+1;\, -e^{2 c z}\right)+$$

$$e^{(a i (m-2 k)+b (u-2 s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (a i (m-2 k)+b (u-2 s)+c \nu)^{-j-1}\right)}{(n-j)!}$$

$$_{j+2}F_{j+1}\left(\frac{i a (m-2 k)+b (u-2 s)+c \nu}{2 c}, \ldots, \frac{i a (m-2 k)+b (u-2 s)+c \nu}{2 c}, \nu;\right.$$

$$\frac{i a (m-2 k)+b (u-2 s)+c \nu}{2 c}+1, \ldots, \frac{i a (m-2 k)+b (u-2 s)+c \nu}{2 c}+$$

Involving sin, tanh and power

## Involving $z^n \sin(a z) \tanh(c z) \operatorname{sech}^\nu(c z)$

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$$\int z^n \sin(a z) \tanh(c z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{4} \left(1 + e^{2 c z}\right)^{\nu+1} n! \operatorname{sech}^{\nu+1}(c z) \left(-e^{\frac{i\pi}{2}+(-c-i a) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a + c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c \nu - i a}{2 c}, \ldots, \frac{c \nu - i a}{2 c}, \nu + 1; \frac{c \nu - i a}{2 c} + 1, \ldots, \frac{c \nu - i a}{2 c} + 1; -e^{2 c z}\right) + e^{\frac{i\pi}{2}+(i a - c) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i a + c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{i a + c \nu}{2 c}, \ldots, \frac{i a + c \nu}{2 c}, \nu + 1; \frac{i a + c \nu}{2 c} + 1, \ldots, \frac{i a + c \nu}{2 c} + 1; -e^{2 c z}\right) - e^{-\frac{1}{2}(i\pi)+(c - i a) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a + c(\nu+2))^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c(\nu+2) - i a}{2 c}, \ldots, \frac{c(\nu+2) - i a}{2 c}, \nu + 1; \frac{c(\nu+2) - i a}{2 c} + 1, \ldots, \frac{c(\nu+2) - i a}{2 c} + 1; -e^{2 c z}\right) + e^{-\frac{1}{2}(i\pi)+(c + i a) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i a + c(\nu+2))^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{i a + c(\nu+2)}{2 c}, \ldots, \frac{i a + c(\nu+2)}{2 c}, \nu + 1; \frac{i a + c(\nu+2)}{2 c} + 1, \ldots, \frac{i a + c(\nu+2)}{2 c} + 1; -e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

Involving powers of sin, powers of tanh and power

## Involving $z^n \sin^m(a z) \tanh^u(c z) \operatorname{sech}^\nu(c z)$

01.24.21.0598.01

$$\int z^n \sin^m(a z) \tanh^u(c z) \operatorname{sech}^\nu(c z)\, dz = i^u\, 2^{-m-u} \left(1 + e^{2 c z}\right)^{u+\nu} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! (1 - m \bmod 2)(1 - u \bmod 2) \operatorname{sech}^{u+\nu}(c z) \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c(u+\nu))^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{u+\nu}{2}, \ldots, \frac{u+\nu}{2}, u + \nu; \frac{u+\nu}{2} + 1, \ldots, \frac{u+\nu}{2} + 1; -e^{2 c z}\right) + \left(\frac{i}{2}\right)^{m+u} \binom{u}{\frac{u}{2}} (1 - u \bmod 2)\, n! \operatorname{sech}^{u+\nu}(c z) \left(1 + e^{2 c z}\right)^{u+\nu} \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left(e^{(-i a (m-2k)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (a i (2k-m) + c(u+\nu))^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{i a (2k-m) + c(u+\nu)}{2 c}, \ldots, \frac{i a (2k-m) + c(u+\nu)}{2 c}, u + \nu; \frac{i a (2k-m) + c(u+\nu)}{2 c} + 1, \ldots, \frac{i a (2k-m) + c(u+\nu)}{2 c} + 1; -e^{2 c z}\right) + (-1)^m e^{(i a (m-2k)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (a i (m-2k) + c(u+\nu))^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{i a (m-2k) + c(u+\nu)}{2 c}, \ldots,\right.\right.$$

$$\frac{i\,a\,(m-2\,k)+c\,(u+v)}{2\,c},\,u+v;\,\frac{i\,a\,(m-2\,k)+c\,(u+v)}{2\,c}+1,\,\ldots,\,\frac{i\,a\,(m-2\,k)+c\,(u+v)}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)\Bigg)+$$

$$2^{-m-u}\binom{m}{\frac{m}{2}}(1-m \bmod 2)\left(1+e^{2\,c\,z}\right)^{u+v} n!\,\operatorname{sech}^{u+v}(c\,z)\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}\Bigg((-1)^u\,e^{-c\,(u-2\,s)\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(c\,(2\,s+v))^{-j-1}\right)}{(n-j)!}$$

$$_{j+2}F_{j+1}\left(\frac{1}{2}\,(2\,s+v),\,\ldots,\,\frac{1}{2}\,(2\,s+v),\,u+v;\,\frac{1}{2}\,(2\,s+v)+1,\,\ldots,\,\frac{1}{2}\,(2\,s+v)+1;\,-e^{2\,c\,z}\right)+$$

$$e^{c\,(u-2\,s)\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(c\,(-2\,s+2\,u+v))^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\Bigg(\frac{1}{2}\,(-2\,s+2\,u+v),\,\ldots,\,\frac{1}{2}\,(-2\,s+2\,u+v),$$

$$u+v;\,\frac{1}{2}\,(-2\,s+2\,u+v)+1,\,\ldots,\,\frac{1}{2}\,(-2\,s+2\,u+v)+1;\,-e^{2\,c\,z}\Bigg)\Bigg)+2^{-m-u}\left(1+e^{2\,c\,z}\right)^{u+v} n!\,\operatorname{sech}^{u+v}(c\,z)$$

$$\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}\Bigg((-1)^u\,e^{\frac{i\,\pi\,m}{2}+(-i\,a\,(m-2\,k)-c\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(2\,i\,a\,k-i\,a\,m+2\,c\,s+c\,v)^{-j-1}\right)}{(n-j)!}$$

$$_{j+2}F_{j+1}\Bigg(\frac{2\,i\,a\,k-i\,a\,m+2\,c\,s+c\,v}{2\,c},\,\ldots,\,\frac{2\,i\,a\,k-i\,a\,m+2\,c\,s+c\,v}{2\,c},\,u+$$

$$v;\,\frac{2\,i\,a\,k-i\,a\,m+2\,c\,s+c\,v}{2\,c}+1,\,\ldots,\,\frac{2\,i\,a\,k-i\,a\,m+2\,c\,s+c\,v}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+$$

$$(-1)^u\,e^{(i\,a\,(m-2\,k)-c\,(u-2\,s))\,z-\frac{i\,m\,\pi}{2}}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(-2\,a\,i\,k+i\,a\,m+2\,c\,s+c\,v)^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}$$

$$\Bigg(\frac{-2\,i\,a\,k+i\,a\,m+2\,c\,s+c\,v}{2\,c},\,\ldots,\,\frac{-2\,i\,a\,k+i\,a\,m+2\,c\,s+c\,v}{2\,c},\,u+v;\,\frac{-2\,i\,a\,k+i\,a\,m+2\,c\,s+c\,v}{2\,c}+$$

$$1,\,\ldots,\,\frac{-2\,i\,a\,k+i\,a\,m+2\,c\,s+c\,v}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+e^{\frac{i\,\pi\,m}{2}+(c\,(u-2\,s)-i\,a\,(m-2\,k))\,z}$$

$$\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(a\,i\,(2\,k-m)+c\,(-2\,s+2\,u+v))^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\Bigg(\frac{i\,a\,(2\,k-m)+c\,(-2\,s+2\,u+v)}{2\,c},$$

$$\ldots,\,\frac{i\,a\,(2\,k-m)+c\,(-2\,s+2\,u+v)}{2\,c},\,u+v;\,\frac{i\,a\,(2\,k-m)+c\,(-2\,s+2\,u+v)}{2\,c}+$$

$$1,\,\ldots,\,\frac{i\,a\,(2\,k-m)+c\,(-2\,s+2\,u+v)}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+e^{(a\,i\,(m-2\,k)+c\,(u-2\,s))\,z-\frac{i\,m\,\pi}{2}}$$

$$\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(a\,i\,(m-2\,k)+c\,(-2\,s+2\,u+v))^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\Bigg(\frac{i\,a\,(m-2\,k)+c\,(-2\,s+2\,u+v)}{2\,c},$$

$$\ldots,\,\frac{i\,a\,(m-2\,k)+c\,(-2\,s+2\,u+v)}{2\,c},\,u+v;\,\frac{i\,a\,(m-2\,k)+c\,(-2\,s+2\,u+v)}{2\,c}+$$

$$1,\,\ldots,\,\frac{i\,a\,(m-2\,k)+c\,(-2\,s+2\,u+v)}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)\Bigg)\,/;\,n\in\mathbb{N}\bigwedge m\in\mathbb{N}^+\bigwedge u\in\mathbb{N}^+$$

Involving cos, tanh and power

## Involving $z^n \cos(a z) \tanh(c z) \operatorname{sech}^\nu(c z)$

01.24.21.0599.01

$$\int z^n \cos(a z) \tanh(c z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{4} \left(1 + e^{2cz}\right)^{\nu+1} n!\, \operatorname{sech}^{\nu+1}(c z) \left( -e^{(-c-i a) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a + c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\!\left(\frac{c\nu - i a}{2c}, \ldots, \frac{c\nu - i a}{2c}, \nu+1; \frac{c\nu - i a}{2c} + 1, \ldots, \frac{c\nu - i a}{2c} + 1; -e^{2cz}\right) - e^{(i a - c) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i a + c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\!\left(\frac{i a + c\nu}{2c}, \ldots, \frac{i a + c\nu}{2c}, \nu+1; \frac{i a + c\nu}{2c} + 1, \ldots, \frac{i a + c\nu}{2c} + 1; -e^{2cz}\right) + e^{(c - i a) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a + c(\nu+2))^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\!\left(\frac{c(\nu+2) - i a}{2c}, \ldots, \frac{c(\nu+2) - i a}{2c}, \nu+1; \frac{c(\nu+2) - i a}{2c} + 1, \ldots, \frac{c(\nu+2) - i a}{2c} + 1; -e^{2cz}\right) + e^{(c + i a) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i a + c(\nu+2))^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\!\left(\frac{i a + c(\nu+2)}{2c}, \ldots, \frac{i a + c(\nu+2)}{2c}, \nu+1; \frac{i a + c(\nu+2)}{2c} + 1, \ldots, \frac{i a + c(\nu+2)}{2c} + 1; -e^{2cz}\right) \right) /; n \in \mathbb{N}$$

Involving powers of cos, powers of tanh and power

## Involving $z^n \cos^m(a z) \tanh^u(c z) \operatorname{sech}^\nu(c z)$

01.24.21.0600.01

$$\int z^n \cos^m(a z) \tanh^u(c z) \operatorname{sech}^\nu(c z)\, dz = i^u\, 2^{-m-u} \left(1 + e^{2cz}\right)^{u+\nu} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n!\, (1 - m \bmod 2)(1 - u \bmod 2) \operatorname{sech}^{u+\nu}(c z) \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c(u+\nu))^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\!\left(\frac{u+\nu}{2}, \ldots, \frac{u+\nu}{2}, u+\nu; \frac{u+\nu}{2} + 1, \ldots, \frac{u+\nu}{2} + 1; -e^{2cz}\right) - i^u\, 2^{-m-u} \binom{u}{\frac{u}{2}} (u \bmod 2 - 1)\, n!\, \operatorname{sech}^{u+\nu}(c z) \left(1 + e^{2cz}\right)^{u+\nu} \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \left( e^{-i a (m - 2 s) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c(u+\nu) - i a (m - 2 s))^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\!\left(\frac{c(u+\nu) - i a (m-2s)}{2c}, \ldots, \frac{c(u+\nu) - i a (m-2s)}{2c}, u+\nu; \frac{c(u+\nu) - i a (m-2s)}{2c} + 1, \ldots, \frac{c(u+\nu) - i a (m-2s)}{2c} + 1; -e^{2cz}\right) + e^{i a (m - 2 s) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (a i (m - 2 s) + c(u+\nu))^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\!\left(\frac{i a (m-2s) + c(u+\nu)}{2c}, \ldots, \frac{i a (m-2s) + c(u+\nu)}{2c}, u+\nu; \frac{i a (m-2s) + c(u+\nu)}{2c} + 1, \ldots, \frac{i a (m-2s) + c(u+\nu)}{2c} + 1; -e^{2cz}\right) \right) +$$

$$2^{-m-u}\binom{m}{\frac{m}{2}}(1-m \bmod 2)\, n!\, \operatorname{sech}^{u+\nu}(c z)\left(1+e^{2 c z}\right)^{u+\nu} \sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\left((-1)^u e^{-c(u-2 k) z} \sum_{j=0}^n \frac{\left((-1)^j z^{n-j}(c(2 k+\nu))^{-j-1}\right)}{(n-j)!}\right.$$

$$_{j+2}F_{j+1}\left(\frac{1}{2}(2 k+\nu), \ldots, \frac{1}{2}(2 k+\nu), u+\nu; \frac{1}{2}(2 k+\nu)+1, \ldots, \frac{1}{2}(2 k+\nu)+1; -e^{2 c z}\right)+$$

$$e^{c(u-2 k) z} \sum_{j=0}^n \frac{\left((-1)^j z^{n-j}(c(-2 k+2 u+\nu))^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{1}{2}(-2 k+2 u+\nu), \ldots, \frac{1}{2}(-2 k+2 u+\nu),\right.$$

$$\left.\left.u+\nu; \frac{1}{2}(-2 k+2 u+\nu)+1, \ldots, \frac{1}{2}(-2 k+2 u+\nu)+1; -e^{2 c z}\right)\right)+2^{-m-u}\, n!\, \operatorname{sech}^{u+\nu}(c z)\left(1+e^{2 c z}\right)^{u+\nu}$$

$$\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor} \sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{s}\binom{u}{k}\left((-1)^u e^{(-i a(m-2 s)-c(u-2 k)) z} \sum_{j=0}^n \frac{\left((-1)^j z^{n-j}(c(2 k+\nu)-i a(m-2 s))^{-j-1}\right)}{(n-j)!}\right.$$

$$_{j+2}F_{j+1}\left(\frac{c(2 k+\nu)-i a(m-2 s)}{2 c}, \ldots, \frac{c(2 k+\nu)-i a(m-2 s)}{2 c}, u+\nu;\right.$$

$$\left.\frac{c(2 k+\nu)-i a(m-2 s)}{2 c}+1, \ldots, \frac{c(2 k+\nu)-i a(m-2 s)}{2 c}+1; -e^{2 c z}\right)+$$

$$(-1)^u e^{(i a(m-2 s)-c(u-2 k)) z} \sum_{j=0}^n \frac{\left((-1)^j z^{n-j}(c(2 k+\nu)+a i(m-2 s))^{-j-1}\right)}{(n-j)!}$$

$$_{j+2}F_{j+1}\left(\frac{i a(m-2 s)+c(2 k+\nu)}{2 c}, \ldots, \frac{i a(m-2 s)+c(2 k+\nu)}{2 c}, u+\nu;\right.$$

$$\left.\frac{i a(m-2 s)+c(2 k+\nu)}{2 c}+1, \ldots, \frac{i a(m-2 s)+c(2 k+\nu)}{2 c}+1; -e^{2 c z}\right)+e^{(c(u-2 k)-i a(m-2 s)) z}$$

$$\sum_{j=0}^n \frac{\left((-1)^j z^{n-j}(c(-2 k+2 u+\nu)-i a(m-2 s))^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c(-2 k+2 u+\nu)-i a(m-2 s)}{2 c},\right.$$

$$\ldots, \frac{c(-2 k+2 u+\nu)-i a(m-2 s)}{2 c}, u+\nu; \frac{c(-2 k+2 u+\nu)-i a(m-2 s)}{2 c}+1,$$

$$\left.\ldots, \frac{c(-2 k+2 u+\nu)-i a(m-2 s)}{2 c}+1; -e^{2 c z}\right)+e^{(a i(m-2 s)+c(u-2 k)) z}$$

$$\sum_{j=0}^n \frac{\left((-1)^j z^{n-j}(c(-2 k+2 u+\nu)+a i(m-2 s))^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{i a(m-2 s)+c(-2 k+2 u+\nu)}{2 c},\right.$$

$$\ldots, \frac{i a(m-2 s)+c(-2 k+2 u+\nu)}{2 c}, u+\nu; \frac{i a(m-2 s)+c(-2 k+2 u+\nu)}{2 c}+1,$$

$$\left.\left.\ldots, \frac{i a(m-2 s)+c(-2 k+2 u+\nu)}{2 c}+1; -e^{2 c z}\right)\right) /; n \in \mathbb{N} \bigwedge m \in \mathbb{N}^+ \bigwedge u \in \mathbb{N}^+$$

## Involving powers of sin, powers of coth and power

## Involving $z^n \sin^m(a z) \coth^u(c z) \operatorname{sech}^v(c z)$

01.24.21.0601.01

$$\int z^n \sin^m(a z) \coth^u(c z) \operatorname{sech}^v(c z)\, dz = 2^{-m} \binom{m}{\frac{m}{2}} (1 - m \bmod 2) \Bigg( (-1)^u 2^v e^{c u z} \binom{u-v}{\frac{u-v}{2}} n!\, (1 - (u-v) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (c u)^{-j-1} z^{n-j}}{(n-j)!} \, _{j+2}F_{j+1}\left(\frac{u}{2}, \ldots, \frac{u}{2}, u; \frac{u}{2}+1, \ldots, \frac{u}{2}+1; e^{2 c z}\right) + (-1)^u 2^v e^{c u z} n! \sum_{k=0}^{\left\lfloor \frac{1}{2}(u-v-1) \right\rfloor} \binom{u-v}{k} \Bigg( e^{c(-2k+u-v) z} \sum_{j=0}^{n} \frac{(-1)^j (c(-2k+2u-v))^{-j-1} z^{n-j}}{(n-j)!} \, _{j+2}F_{j+1}\left(\frac{1}{2}(-2k+2u-v), \ldots, \frac{1}{2}(-2k+2u-v), u; \frac{1}{2}(-2k+2u-v)+1, \ldots, \frac{1}{2}(-2k+2u-v)+1; e^{2 c z}\right) + e^{-c(-2k+u-v) z} \sum_{j=0}^{n} \frac{(-1)^j (c(2k+v))^{-j-1} z^{n-j}}{(n-j)!} \, _{j+2}F_{j+1}\left(\frac{1}{2}(2k+v), \ldots, \frac{1}{2}(2k+v), u; \frac{1}{2}(2k+v)+1, \ldots, \frac{1}{2}(2k+v)+1; e^{2 c z}\right)\Bigg)\Bigg) +$$

$$2^{-m} \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^s \binom{m}{s} \Bigg( e^{\frac{i m \pi}{2}} \Bigg( (-1)^u 2^v e^{(c u - i a (m-2s)) z} \binom{u-v}{\frac{u-v}{2}} n!\, (1 - (u-v) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (c u - i a (m-2s))^{-j-1} z^{n-j}}{(n-j)!} \, _{j+2}F_{j+1}\left(\frac{c u - i a (m-2s)}{2 c}, \ldots, \frac{c u - i a (m-2s)}{2 c}, u; \frac{c u - i a (m-2s)}{2 c}+1, \ldots, \frac{c u - i a (m-2s)}{2 c}+1; e^{2 c z}\right) + (-1)^u 2^v e^{c u z} n! \sum_{k=0}^{\left\lfloor \frac{1}{2}(u-v-1) \right\rfloor} \binom{u-v}{k} \Bigg( e^{(c(-2k+u-v) - i a (m-2s)) z} \sum_{j=0}^{n} \frac{(-1)^j (c(-2k+2u-v) - i a (m-2s))^{-j-1} z^{n-j}}{(n-j)!} \, _{j+2}F_{j+1}\left(\frac{c(-2k+2u-v) - i a (m-2s)}{2 c}, \ldots, \frac{c(-2k+2u-v) - i a (m-2s)}{2 c}, u; \frac{c(-2k+2u-v) - i a (m-2s)}{2 c}+1, \ldots, \frac{c(-2k+2u-v) - i a (m-2s)}{2 c}+1; e^{2 c z}\right) + e^{(-i a (m-2s) - c(-2k+u-v)) z} \sum_{j=0}^{n} \frac{(-1)^j (c(2k+v) - i a (m-2s))^{-j-1} z^{n-j}}{(n-j)!} \, _{j+2}F_{j+1}\left(\frac{c(2k+v) - i a (m-2s)}{2 c}, \ldots, \frac{c(2k+v) - i a (m-2s)}{2 c}, u; \frac{c(2k+v) - i a (m-2s)}{2 c}+1, \ldots, \frac{c(2k+v) - i a (m-2s)}{2 c}+1; e^{2 c z}\right)\Bigg)\Bigg) +$$

$$e^{-\frac{1}{2} i m \pi} \left( (-1)^u 2^v e^{(a i (m-2s)+c u) z} \binom{u-v}{\frac{u-v}{2}} n! \, (1-(u-v) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (a i (m-2s)+c u)^{-j-1} z^{n-j}}{(n-j)!} \right.$$
$$_{j+2}F_{j+1}\left( \frac{i a (m-2s)+c u}{2c}, \ldots, \frac{i a (m-2s)+c u}{2c}, u; \frac{i a (m-2s)+c u}{2c}+1, \right.$$
$$\left. \ldots, \frac{i a (m-2s)+c u}{2c}+1; e^{2cz} \right) + (-1)^u 2^v e^{c u z} n!$$
$$\sum_{k=0}^{\left\lfloor \frac{1}{2}(u-v-1) \right\rfloor} \binom{u-v}{k} \left( e^{(a i (m-2s)+c(-2k+u-v)) z} \sum_{j=0}^{n} \frac{(-1)^j (a i (m-2s)+c(-2k+2u-v))^{-j-1} z^{n-j}}{(n-j)!} \right.$$
$$_{j+2}F_{j+1}\left( \frac{i a (m-2s)+c(-2k+2u-v)}{2c}, \ldots, \frac{i a (m-2s)+c(-2k+2u-v)}{2c}, u; \right.$$
$$\left. \frac{i a (m-2s)+c(-2k+2u-v)}{2c}+1, \ldots, \frac{i a (m-2s)+c(-2k+2u-v)}{2c}+1; e^{2cz} \right) +$$
$$e^{(i a (m-2s)-c(-2k+u-v)) z} \sum_{j=0}^{n} \frac{(-1)^j (a i (m-2s)+c(2k+v))^{-j-1} z^{n-j}}{(n-j)!} \, _{j+2}F_{j+1}$$
$$\left( \frac{i a (m-2s)+c(2k+v)}{2c}, \ldots, \frac{i a (m-2s)+c(2k+v)}{2c}, u; \frac{i a (m-2s)+c(2k+v)}{2c}+1, \right.$$
$$\left. \left. \left. \ldots, \frac{i a (m-2s)+c(2k+v)}{2c}+1; e^{2cz} \right) \right) \right) /; n \in \mathbb{N} \land m \in \mathbb{N}^+ \land u \in \mathbb{Z} \land u \geq v \land v \in \mathbb{N}^+$$

## Involving powers of cos, powers of coth and power

### Involving $z^n \cos^m(a z) \coth^u(c z) \operatorname{sech}^v(c z)$

01.24.21.0602.01

$$\int z^n \cos^m(a z) \coth^u(c z) \operatorname{sech}^v(c z) \, dz = 2^{-m} \binom{m}{\frac{m}{2}} (1 - m \bmod 2)$$
$$\left( (-1)^u 2^v e^{c u z} \binom{u-v}{\frac{u-v}{2}} n! \, (1-(u-v) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (c u)^{-j-1} z^{n-j}}{(n-j)!} \, _{j+2}F_{j+1}\left( \frac{u}{2}, \ldots, \frac{u}{2}, u; \frac{u}{2}+1, \ldots, \frac{u}{2}+1; e^{2cz} \right) + \right.$$
$$(-1)^u 2^v e^{c u z} n! \sum_{k=0}^{\left\lfloor \frac{1}{2}(u-v-1) \right\rfloor} \binom{u-v}{k} \left( e^{c(-2k+u-v) z} \sum_{j=0}^{n} \frac{(-1)^j (c(-2k+2u-v))^{-j-1} z^{n-j}}{(n-j)!} \, _{j+2}F_{j+1}\left( \frac{1}{2}(-2k+2u-v), \right. \right.$$
$$\left. \ldots, \frac{1}{2}(-2k+2u-v), u; \frac{1}{2}(-2k+2u-v)+1, \ldots, \frac{1}{2}(-2k+2u-v)+1; e^{2cz} \right) +$$
$$e^{-c(-2k+u-v) z} \sum_{j=0}^{n} \frac{(-1)^j (c(2k+v))^{-j-1} z^{n-j}}{(n-j)!} \, _{j+2}F_{j+1}\left( \frac{1}{2}(2k+v), \ldots, \frac{1}{2}(2k+v), u; \right.$$

$$\frac{1}{2}(2k+v)+1,\ \ldots,\ \frac{1}{2}(2k+v)+1;\ e^{2cz}\Bigg)\Bigg)\Bigg)+$$

$$2^{-m}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\Bigg((-1)^u\,2^v\,e^{(c\,u-i\,a\,(m-2\,s))\,z}\binom{u-v}{\frac{u-v}{2}}n!\,(1-(u-v)\bmod 2)\sum_{j=0}^{n}\frac{(-1)^j\,(c\,u-i\,a\,(m-2\,s))^{-j-1}\,z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}$$

$$\left(\frac{c\,u-i\,a\,(m-2\,s)}{2\,c},\ \ldots,\ \frac{c\,u-i\,a\,(m-2\,s)}{2\,c},\ u;\ \frac{c\,u-i\,a\,(m-2\,s)}{2\,c}+1,\ \ldots,\ \frac{c\,u-i\,a\,(m-2\,s)}{2\,c}+1;\ e^{2cz}\right)+$$

$$(-1)^u\,2^v\,e^{(a\,i\,(m-2\,s)+c\,u)\,z}\binom{u-v}{\frac{u-v}{2}}n!\,(1-(u-v)\bmod 2)\sum_{j=0}^{n}\frac{(-1)^j\,(a\,i\,(m-2\,s)+c\,u)^{-j-1}\,z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}$$

$$\left(\frac{i\,a\,(m-2\,s)+c\,u}{2\,c},\ \ldots,\ \frac{i\,a\,(m-2\,s)+c\,u}{2\,c},\ u;\ \frac{i\,a\,(m-2\,s)+c\,u}{2\,c}+1,\ \ldots,\ \frac{i\,a\,(m-2\,s)+c\,u}{2\,c}+1;\ e^{2cz}\right)+$$

$$(-1)^u\,2^v\,e^{c\,u\,z}\,n!\sum_{k=0}^{\left\lfloor\frac{1}{2}(u-v-1)\right\rfloor}\binom{u-v}{k}\Bigg(e^{(c\,(-2\,k+u-v)-i\,a\,(m-2\,s))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(c\,(-2\,k+2\,u-v)-i\,a\,(m-2\,s))^{-j-1}\,z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{c\,(-2\,k+2\,u-v)-i\,a\,(m-2\,s)}{2\,c},\ \ldots,\ \frac{c\,(-2\,k+2\,u-v)-i\,a\,(m-2\,s)}{2\,c},\ u;$$

$$\frac{c\,(-2\,k+2\,u-v)-i\,a\,(m-2\,s)}{2\,c}+1,\ \ldots,\ \frac{c\,(-2\,k+2\,u-v)-i\,a\,(m-2\,s)}{2\,c}+1;\ e^{2cz}\Bigg)+$$

$$e^{(-i\,a\,(m-2\,s)-c\,(-2\,k+u-v))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(c\,(2\,k+v)-i\,a\,(m-2\,s))^{-j-1}\,z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}$$

$$\Bigg(\frac{c\,(2\,k+v)-i\,a\,(m-2\,s)}{2\,c},\ \ldots,\ \frac{c\,(2\,k+v)-i\,a\,(m-2\,s)}{2\,c},\ u;$$

$$\frac{c\,(2\,k+v)-i\,a\,(m-2\,s)}{2\,c}+1,\ \ldots,\ \frac{c\,(2\,k+v)-i\,a\,(m-2\,s)}{2\,c}+1;\ e^{2cz}\Bigg)\Bigg)+$$

$$(-1)^u\,2^v\,e^{c\,u\,z}\,n!\sum_{k=0}^{\left\lfloor\frac{1}{2}(u-v-1)\right\rfloor}\binom{u-v}{k}\Bigg(e^{(a\,i\,(m-2\,s)+c\,(-2\,k+u-v))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(a\,i\,(m-2\,s)+c\,(-2\,k+2\,u-v))^{-j-1}\,z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{i\,a\,(m-2\,s)+c\,(-2\,k+2\,u-v)}{2\,c},\ \ldots,\ \frac{i\,a\,(m-2\,s)+c\,(-2\,k+2\,u-v)}{2\,c},\ u;$$

$$\frac{i\,a\,(m-2\,s)+c\,(-2\,k+2\,u-v)}{2\,c}+1,\ \ldots,\ \frac{i\,a\,(m-2\,s)+c\,(-2\,k+2\,u-v)}{2\,c}+1;\ e^{2cz}\Bigg)+$$

$$e^{(i\,a\,(m-2\,s)-c\,(-2\,k+u-v))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(a\,i\,(m-2\,s)+c\,(2\,k+v))^{-j-1}\,z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}$$

$$\Bigg(\frac{i\,a\,(m-2\,s)+c\,(2\,k+v)}{2\,c},\ \ldots,\ \frac{i\,a\,(m-2\,s)+c\,(2\,k+v)}{2\,c},\ u;\ \frac{i\,a\,(m-2\,s)+c\,(2\,k+v)}{2\,c}+1,$$

$$\ldots,\ \frac{i\,a\,(m-2\,s)+c\,(2\,k+v)}{2\,c}+1;\ e^{2cz}\Bigg)\Bigg)\Bigg)\Bigg)\ /;\ n\in\mathbb{N}\land m\in\mathbb{N}^+\land u\in\mathbb{Z}\land u\geq v\land v\in\mathbb{N}^+$$

**Involving functions of the direct function, hyperbolic, exponential, trigonometric and a power functions**

## Involving powers of the direct function, hyperbolic, exponential, trigonometric and a power functions

### Involving sin, sinh, exp and power

#### Involving $z^n e^{p z} \sin(a z) \sinh(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0603.01

$$\int z^n e^{p z} \sin(a z) \sinh(b z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{4}\left(1+e^{2 c z}\right)^\nu n! \operatorname{sech}^\nu(c z)\left(-e^{\frac{i\pi}{2}+(-b-i a+p) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (-b-i a+p+c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c \nu+p-i a-b}{2 c}, \ldots, \frac{c \nu+p-i a-b}{2 c}, \nu; \frac{c \nu+p-i a-b}{2 c}+1, \ldots, \frac{c \nu+p-i a-b}{2 c}+1; -e^{2 c z}\right)+ e^{-\frac{1}{2}(i\pi)+(b+i a+p) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (b+i a+p+c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c \nu+p+i a+b}{2 c}, \ldots, \frac{c \nu+p+i a+b}{2 c}, \nu; \frac{c \nu+p+i a+b}{2 c}+1, \ldots, \frac{c \nu+p+i a+b}{2 c}+1; -e^{2 c z}\right)- e^{-\frac{1}{2}(i\pi)+(b-i a+p) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (b-i a+p+c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c \nu+p-i a+b}{2 c}, \ldots, \frac{c \nu+p-i a+b}{2 c}, \nu; \frac{c \nu+p-i a+b}{2 c}+1, \ldots, \frac{c \nu+p-i a+b}{2 c}+1; -e^{2 c z}\right)+ e^{\frac{i\pi}{2}+(-b+i a+p) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (-b+i a+p+c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c \nu+p+i a-b}{2 c}, \ldots, \frac{c \nu+p+i a-b}{2 c}, \nu; \frac{c \nu+p+i a-b}{2 c}+1, \ldots, \frac{c \nu+p+i a-b}{2 c}+1; -e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

### Involving powers of sin, powers of sinh, exp and power

#### Involving $z^n e^{p z} \sin^m(a z) \sinh^u(b z) \operatorname{sech}^\nu(c z)$

01.24.21.0604.01

$$\int z^n e^{p z} \sin^m(a z) \sinh^u(b z) \operatorname{sech}^\nu(c z)\, dz = i^u 2^{-m-u} e^{p z} \left(1+e^{2 c z}\right)^\nu \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! (1-m \bmod 2)(1-u \bmod 2) \operatorname{sech}^\nu(c z) \sum_{j=0}^n \frac{(-1)^j z^{n-j} (p+c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c \nu+p}{2 c}, \ldots, \frac{c \nu+p}{2 c}, \nu; \frac{c \nu+p}{2 c}+1, \ldots, \frac{c \nu+p}{2 c}+1; -e^{2 c z}\right)+ \left(\frac{i}{2}\right)^{m+u} \binom{u}{\frac{u}{2}} (1-u \bmod 2) n! \operatorname{sech}^\nu(c z) \left(1+e^{2 c z}\right)^\nu$$

$$\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left( e^{(p-i a (m-2k)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (a i (2k-m)+p+c\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{a i (2k-m)+p+c\nu}{2c}, \ldots, \right.\right.$$

$$\left. \frac{a i (2k-m)+p+c\nu}{2c}, \nu; \frac{a i (2k-m)+p+c\nu}{2c}+1, \ldots, \frac{a i (2k-m)+p+c\nu}{2c}+1; -e^{2cz} \right) +$$

$$(-1)^m e^{(a i (m-2k)+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (a i (m-2k)+p+c\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{a i (m-2k)+p+c\nu}{2c}, \ldots, \right.$$

$$\left.\left. \frac{a i (m-2k)+p+c\nu}{2c}, \nu; \frac{a i (m-2k)+p+c\nu}{2c}+1, \ldots, \frac{a i (m-2k)+p+c\nu}{2c}+1; -e^{2cz} \right)\right) +$$

$$2^{-m-u} \binom{m}{\frac{m}{2}} (1 - m \bmod 2) \left(1+e^{2cz}\right)^{\nu} n! \operatorname{sech}^{\nu}(cz) \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^s \binom{u}{s} \left( (-1)^u e^{(p-b(u-2s)) z} \right.$$

$$\sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p-b(u-2s)+c\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{p-b(u-2s)+c\nu}{2c}, \ldots, \right.$$

$$\left. \frac{p-b(u-2s)+c\nu}{2c}, \nu; \frac{p-b(u-2s)+c\nu}{2c}+1, \ldots, \frac{p-b(u-2s)+c\nu}{2c}+1; -e^{2cz} \right) +$$

$$e^{(p+b(u-2s)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+b(u-2s)+c\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left( \frac{p+b(u-2s)+c\nu}{2c}, \ldots, \frac{p+b(u-2s)+c\nu}{2c}, \right.$$

$$\left.\left. \nu; \frac{p+b(u-2s)+c\nu}{2c}+1, \ldots, \frac{p+b(u-2s)+c\nu}{2c}+1; -e^{2cz} \right)\right) + 2^{-m-u} \left(1+e^{2cz}\right)^{\nu} n! \operatorname{sech}^{\nu}(cz)$$

$$\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^s \binom{u}{s} \left( (-1)^u e^{\frac{i\pi m}{2} + (-i a (m-2k)+p-b(u-2s)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a (m-2k)+p-b(u-2s)+c\nu)^{-j-1}}{(n-j)!} \right.$$

$$ {}_{j+2}F_{j+1}\left( \frac{2 i a k - i a m + p + 2 b s - b u + c\nu}{2c}, \ldots, \frac{2 i a k - i a m + p + 2 b s - b u + c\nu}{2c}, \nu; \right.$$

$$\left. \frac{2 i a k - i a m + p + 2 b s - b u + c\nu}{2c}+1, \ldots, \frac{2 i a k - i a m + p + 2 b s - b u + c\nu}{2c}+1; -e^{2cz} \right) +$$

$$(-1)^u e^{(a i (m-2k)+p-b(u-2s)) z - \frac{i m\pi}{2}} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (a i (m-2k)+p-b(u-2s)+c\nu)^{-j-1}}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\left( \frac{a i (m-2k)+p+b(2s-u)+c\nu}{2c}, \ldots, \frac{a i (m-2k)+p+b(2s-u)+c\nu}{2c}, \nu; \right.$$

$$\left. \frac{a i (m-2k)+p+b(2s-u)+c\nu}{2c}+1, \ldots, \frac{a i (m-2k)+p+b(2s-u)+c\nu}{2c}+1; -e^{2cz} \right) +$$

$$e^{\frac{i\pi m}{2} + (-i a (m-2k)+p+b(u-2s)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a (m-2k)+p+b(u-2s)+c\nu)^{-j-1}}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\left( \frac{-i a (m-2k)+p+b(u-2s)+c\nu}{2c}, \ldots, \frac{-i a (m-2k)+p+b(u-2s)+c\nu}{2c}, \nu; \right.$$

$$\frac{-i\,a\,(m-2\,k)+p+b\,(u-2\,s)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{-i\,a\,(m-2\,k)+p+b\,(u-2\,s)+c\,\nu}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+$$

$$e^{(a\,i\,(m-2\,k)+p+b\,(u-2\,s))\,z-\frac{i\,m\,\pi}{2}}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(a\,i\,(m-2\,k)+p+b\,(u-2\,s)+c\,\nu)^{-j-1}}{(n-j)!}$$

$$_{j+2}F_{j+1}\Bigg(\frac{a\,i\,(m-2\,k)+p+b\,(u-2\,s)+c\,\nu}{2\,c},\,\ldots,$$

$$\frac{a\,i\,(m-2\,k)+p+b\,(u-2\,s)+c\,\nu}{2\,c},\,\nu;\,\frac{a\,i\,(m-2\,k)+p+b\,(u-2\,s)+c\,\nu}{2\,c}+$$

$$1,\,\ldots,\,\frac{a\,i\,(m-2\,k)+p+b\,(u-2\,s)+c\,\nu}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)\Bigg)\,/;\,n\in\mathbb{N}\bigwedge m\in\mathbb{N}^+\bigwedge u\in\mathbb{N}^+$$

Involving cos, sinh, exp and power

## Involving $z^n\,e^{p\,z}\cos(a\,z)\sinh(b\,z)\operatorname{sech}^\nu(c\,z)$

01.24.21.0605.01

$$\int z^n\,e^{p\,z}\cos(a\,z)\sinh(b\,z)\operatorname{sech}^\nu(c\,z)\,dz=$$

$$\frac{i}{4}\left(1+e^{2\,c\,z}\right)^\nu\,n!\operatorname{sech}^\nu(c\,z)\Bigg(e^{\frac{i\,\pi}{2}+(-b-i\,a+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(-b-i\,a+p+c\,\nu)^{-j-1}}{(n-j)!}\,_{j+2}F_{j+1}$$

$$\Bigg(\frac{c\,\nu+p-i\,a-b}{2\,c},\,\ldots,\,\frac{c\,\nu+p-i\,a-b}{2\,c},\,\nu;\,\frac{c\,\nu+p-i\,a-b}{2\,c}+1,\,\ldots,\,\frac{c\,\nu+p-i\,a-b}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+$$

$$e^{-\frac{1}{2}(i\,\pi)+(b+i\,a+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(b+i\,a+p+c\,\nu)^{-j-1}}{(n-j)!}\,_{j+2}F_{j+1}\Bigg(\frac{c\,\nu+p+i\,a+b}{2\,c},\,\ldots,\,\frac{c\,\nu+p+i\,a+b}{2\,c},$$

$$\nu;\,\frac{c\,\nu+p+i\,a+b}{2\,c}+1,\,\ldots,\,\frac{c\,\nu+p+i\,a+b}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+$$

$$e^{-\frac{1}{2}(i\,\pi)+(b-i\,a+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(b-i\,a+p+c\,\nu)^{-j-1}}{(n-j)!}\,_{j+2}F_{j+1}\Bigg(\frac{c\,\nu+p-i\,a+b}{2\,c},\,\ldots,\,\frac{c\,\nu+p-i\,a+b}{2\,c},$$

$$\nu;\,\frac{c\,\nu+p-i\,a+b}{2\,c}+1,\,\ldots,\,\frac{c\,\nu+p-i\,a+b}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+$$

$$e^{\frac{i\,\pi}{2}+(-b+i\,a+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(-b+i\,a+p+c\,\nu)^{-j-1}}{(n-j)!}\,_{j+2}F_{j+1}\Bigg(\frac{c\,\nu+p+i\,a-b}{2\,c},\,\ldots,\,\frac{c\,\nu+p+i\,a-b}{2\,c},$$

$$\nu;\,\frac{c\,\nu+p+i\,a-b}{2\,c}+1,\,\ldots,\,\frac{c\,\nu+p+i\,a-b}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)\Bigg)\,/;\,n\in\mathbb{N}$$

Involving powers of cos, powers of sinh, exp and power

## Involving $z^n\,e^{p\,z}\cos^m(a\,z)\sinh^u(b\,z)\operatorname{sech}^\nu(c\,z)$

01.24.21.0606.01

$$\int z^n e^{pz}\cos^m(az)\sinh^u(bz)\operatorname{sech}^\nu(cz)\,dz = i^u\,2^{-m-u}\,e^{pz}\left(1+e^{2cz}\right)^\nu\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}n!\,(1-m\bmod 2)\,(1-u\bmod 2)$$

$$\operatorname{sech}^\nu(cz)\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{c\nu+p}{2c},\ldots,\frac{c\nu+p}{2c},\nu;\frac{c\nu+p}{2c}+1,\ldots,\frac{c\nu+p}{2c}+1;-e^{2cz}\right)-$$

$$i^u\,2^{-m-u}\binom{u}{\frac{u}{2}}(u\bmod 2-1)\,n!\,\operatorname{sech}^\nu(cz)\left(1+e^{2cz}\right)^\nu$$

$$\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\Bigg(e^{(p+ai(m-2s))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p+ai(m-2s)+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{p+ai(m-2s)+c\nu}{2c},\ldots,\right.$$

$$\left.\frac{p+ai(m-2s)+c\nu}{2c},\nu;\frac{p+ai(m-2s)+c\nu}{2c}+1,\ldots,\frac{p+ai(m-2s)+c\nu}{2c}+1;-e^{2cz}\right)+$$

$$e^{(p-ia(m-2s))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p-ia(m-2s)+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{p-ia(m-2s)+c\nu}{2c},\ldots,\right.$$

$$\left.\left.\frac{p-ia(m-2s)+c\nu}{2c},\nu;\frac{p-ia(m-2s)+c\nu}{2c}+1,\ldots,\frac{p-ia(m-2s)+c\nu}{2c}+1;-e^{2cz}\right)\right)+$$

$$i^u\,2^{-m-u}\binom{m}{\frac{m}{2}}(1-m\bmod 2)\,n!\,\operatorname{sech}^\nu(cz)\left(1+e^{2cz}\right)^\nu\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}$$

$$\Bigg(e^{(p+b(u-2k))z-\frac{i\pi u}{2}}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p+b(u-2k)+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{p+b(u-2k)+c\nu}{2c},\ldots,\right.$$

$$\left.\frac{p+b(u-2k)+c\nu}{2c},\nu;\frac{p+b(u-2k)+c\nu}{2c}+1,\ldots,\frac{p+b(u-2k)+c\nu}{2c}+1;-e^{2cz}\right)+$$

$$e^{\frac{i\pi u}{2}+(p-b(u-2k))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p-b(u-2k)+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{p-b(u-2k)+c\nu}{2c},\ldots,\frac{p-b(u-2k)+c\nu}{2c},\right.$$

$$\left.\left.\nu;\frac{p-b(u-2k)+c\nu}{2c}+1,\ldots,\frac{p-b(u-2k)+c\nu}{2c}+1;-e^{2cz}\right)\right)+i^u\,2^{-m-u}\,n!\,\operatorname{sech}^\nu(cz)\left(1+e^{2cz}\right)^\nu$$

$$\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{s}\binom{u}{k}\Bigg(e^{\frac{i\pi u}{2}+(p-ia(m-2s)-b(u-2k))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p-ia(m-2s)-b(u-2k)+c\nu)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\!\left(\frac{p-ia(m-2s)-b(u-2k)+c\nu}{2c},\ldots,\frac{p-ia(m-2s)-b(u-2k)+c\nu}{2c},\nu;\right.$$

$$\left.\frac{p-ia(m-2s)-b(u-2k)+c\nu}{2c}+1,\ldots,\frac{p-ia(m-2s)-b(u-2k)+c\nu}{2c}+1;-e^{2cz}\right)+$$

$$e^{(p+ai(m-2s)+b(u-2k))z-\frac{i\pi u}{2}}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p+ai(m-2s)+b(u-2k)+c\nu)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\!\left(\frac{p+ai(m-2s)+b(u-2k)+c\nu}{2c},\ldots,\frac{p+ai(m-2s)+b(u-2k)+c\nu}{2c},\nu;\right.$$

$$\frac{p + a\,i\,(m-2\,s) + b\,(u-2\,k) + c\,\nu}{2\,c} + 1,\, \ldots,\, \frac{p + a\,i\,(m-2\,s) + b\,(u-2\,k) + c\,\nu}{2\,c} + 1;\, -e^{2\,c\,z}\Bigg) +$$

$$e^{(p - i\,a\,(m-2\,s) + b\,(u-2\,k))\,z - \frac{i\,\pi\,u}{2}} \sum_{j=0}^{n} \frac{(-1)^j\, z^{n-j}\, (p - i\,a\,(m-2\,s) + b\,(u-2\,k) + c\,\nu)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{p - i\,a\,(m-2\,s) + b\,(u-2\,k) + c\,\nu}{2\,c},\, \ldots,\, \frac{p - i\,a\,(m-2\,s) + b\,(u-2\,k) + c\,\nu}{2\,c},\, \nu;$$

$$\frac{p - i\,a\,(m-2\,s) + b\,(u-2\,k) + c\,\nu}{2\,c} + 1,\, \ldots,\, \frac{p - i\,a\,(m-2\,s) + b\,(u-2\,k) + c\,\nu}{2\,c} + 1;\, -e^{2\,c\,z}\Bigg) +$$

$$e^{\frac{i\,\pi\,u}{2} + (p + a\,i\,(m-2\,s) - b\,(u-2\,k))\,z} \sum_{j=0}^{n} \frac{(-1)^j\, z^{n-j}\, (p + a\,i\,(m-2\,s) - b\,(u-2\,k) + c\,\nu)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{p + a\,i\,(m-2\,s) - b\,(u-2\,k) + c\,\nu}{2\,c},\, \ldots,\, \frac{p + a\,i\,(m-2\,s) - b\,(u-2\,k) + c\,\nu}{2\,c},$$

$$\nu;\, \frac{p + a\,i\,(m-2\,s) - b\,(u-2\,k) + c\,\nu}{2\,c} + 1,\, \ldots,$$

$$\frac{p + a\,i\,(m-2\,s) - b\,(u-2\,k) + c\,\nu}{2\,c} + 1;\, -e^{2\,c\,z}\Bigg)\Bigg) /;\, n \in \mathbb{N} \land m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

## Involving sin, cosh, exp and power

### Involving $z^n\, e^{p\,z} \sin(a\,z) \cosh(b\,z) \operatorname{sech}^{\nu}(c\,z)$

01.24.21.0607.01

$$\int z^n e^{pz}\sin(az)\cosh(bz)\operatorname{sech}^\nu(cz)\,dz = \frac{1}{4}\left(1+e^{2cz}\right)^\nu n!\operatorname{sech}^\nu(cz)\left(e^{\frac{i\pi}{2}+(-b-ia+p)z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(-b-ia+p+c\nu)^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{-ia-b+p+c\nu}{2c},\ldots,\frac{-ia-b+p+c\nu}{2c},\nu;\frac{-ia-b+p+c\nu}{2c}+1,\ldots,\frac{-ia-b+p+c\nu}{2c}+1;-e^{2cz}\right)-e^{\frac{i\pi}{2}+(-b+ia+p)z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(-b+ia+p+c\nu)^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{ia-b+p+c\nu}{2c},\ldots,\frac{ia-b+p+c\nu}{2c},\nu;\frac{ia-b+p+c\nu}{2c}+1,\ldots,\frac{ia-b+p+c\nu}{2c}+1;-e^{2cz}\right)-e^{-\frac{1}{2}(i\pi)+(b-ia+p)z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(b-ia+p+c\nu)^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{-ia+b+p+c\nu}{2c},\ldots,\frac{-ia+b+p+c\nu}{2c},\nu;\frac{-ia+b+p+c\nu}{2c}+1,\ldots,\frac{-ia+b+p+c\nu}{2c}+1;-e^{2cz}\right)+e^{-\frac{1}{2}(i\pi)+(b+ia+p)z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(b+ia+p+c\nu)^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{ia+b+p+c\nu}{2c},\ldots,\frac{ia+b+p+c\nu}{2c},\nu;\frac{ia+b+p+c\nu}{2c}+1,\ldots,\frac{ia+b+p+c\nu}{2c}+1;-e^{2cz}\right)\right)\;/;\;n\in\mathbb{N}$$

## Involving powers of sin, powers of cosh, exp and power

### Involving $z^n e^{pz}\sin^m(az)\cosh^u(bz)\operatorname{sech}^\nu(cz)$

01.24.21.0608.01

$$\int z^n e^{pz}\sin^m(az)\cosh^u(bz)\operatorname{sech}^\nu(cz)\,dz = 2^{-m-u}e^{pz}\left(1+e^{2cz}\right)^\nu\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}n!\,(1-m\bmod 2)(1-u\bmod 2)\left(\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{p+c\nu}{2c},\ldots,\frac{p+c\nu}{2c},\nu;\frac{p+c\nu}{2c}+1,\ldots,\frac{p+c\nu}{2c}+1;-e^{2cz}\right)\right)\operatorname{sech}^\nu(cz)+2^{-m-u}\left(1+e^{2cz}\right)^\nu\binom{u}{\frac{u}{2}}n!\,(1-u\bmod 2)\left(\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(e^{(ai(m-2k)+p)z-\frac{im\pi}{2}}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(ai(m-2k)+p+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{ai(m-2k)+p+c\nu}{2c},\ldots,\frac{ai(m-2k)+p+c\nu}{2c},\nu;\frac{ai(m-2k)+p+c\nu}{2c}+1,\ldots,\frac{ai(m-2k)+p+c\nu}{2c}+1;-e^{2cz}\right)+e^{\frac{i\pi m}{2}+(p-ia(m-2k))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(-ia(m-2k)+p+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{-ia(m-2k)+p+c\nu}{2c},\ldots,\right.\right.\right.$$

$$\left.\left.\left.\frac{-i\,a\,(m-2\,k)+p+c\,\nu}{2\,c},\,\nu;\,\frac{-i\,a\,(m-2\,k)+p+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{-i\,a\,(m-2\,k)+p+c\,\nu}{2\,c}+1;\,-e^{2\,c\,z}\right)\right)\right)$$

$$\operatorname{sech}^{\nu}(c\,z)-2^{-m-u}\binom{m}{\frac{m}{2}}(m \bmod 2-1)\,n!\left(1+e^{2\,c\,z}\right)^{\nu}\left(\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(e^{(p+b\,(u-2\,s))\,z}\right.\right.$$

$$\sum_{j=0}^{n}\frac{(-1)^{j}\,z^{n-j}\,(p+b\,(u-2\,s)+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{p+b\,(u-2\,s)+c\,\nu}{2\,c},\,\ldots,\,\frac{p+b\,(u-2\,s)+c\,\nu}{2\,c},\right.$$

$$\left.\nu;\,\frac{p+b\,(u-2\,s)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{p+b\,(u-2\,s)+c\,\nu}{2\,c}+1;\,-e^{2\,c\,z}\right)+$$

$$e^{(p-b\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{(-1)^{j}\,z^{n-j}\,(p-b\,(u-2\,s)+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{p-b\,(u-2\,s)+c\,\nu}{2\,c},\,\ldots,\,\frac{p-b\,(u-2\,s)+c\,\nu}{2\,c},\right.$$

$$\left.\left.\left.\nu;\,\frac{p-b\,(u-2\,s)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{p-b\,(u-2\,s)+c\,\nu}{2\,c}+1;\,-e^{2\,c\,z}\right)\right)\right)\operatorname{sech}^{\nu}(c\,z)+2^{-m-u}\left(1+e^{2\,c\,z}\right)^{\nu}n!$$

$$\left(\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^{k}\binom{m}{k}\binom{u}{s}\left(e^{(a\,i\,(m-2\,k)+p-b\,(u-2\,s))\,z-\frac{i\,m\,\pi}{2}}\sum_{j=0}^{n}\frac{(-1)^{j}\,z^{n-j}\,(a\,i\,(m-2\,k)+p-b\,(u-2\,s)+c\,\nu)^{-j-1}}{(n-j)!}\right.\right.$$

$${}_{j+2}F_{j+1}\left(\frac{a\,i\,(m-2\,k)+p+b\,(2\,s-u)+c\,\nu}{2\,c},\,\ldots,\,\frac{a\,i\,(m-2\,k)+p+b\,(2\,s-u)+c\,\nu}{2\,c},\,\nu;\right.$$

$$\left.\frac{a\,i\,(m-2\,k)+p+b\,(2\,s-u)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{a\,i\,(m-2\,k)+p+b\,(2\,s-u)+c\,\nu}{2\,c}+1;\,-e^{2\,c\,z}\right)+$$

$$e^{\frac{i\,\pi\,m}{2}+(-i\,a\,(m-2\,k)+p+b\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{(-1)^{j}\,z^{n-j}\,(-i\,a\,(m-2\,k)+p+b\,(u-2\,s)+c\,\nu)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{-i\,a\,(m-2\,k)+p+b\,(u-2\,s)+c\,\nu}{2\,c},\,\ldots,\,\frac{-i\,a\,(m-2\,k)+p+b\,(u-2\,s)+c\,\nu}{2\,c},\,\nu;\right.$$

$$\left.\frac{-i\,a\,(m-2\,k)+p+b\,(u-2\,s)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{-i\,a\,(m-2\,k)+p+b\,(u-2\,s)+c\,\nu}{2\,c}+1;\,-e^{2\,c\,z}\right)+$$

$$e^{\frac{i\,\pi\,m}{2}+(-i\,a\,(m-2\,k)+p-b\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{(-1)^{j}\,z^{n-j}\,(-i\,a\,(m-2\,k)+p-b\,(u-2\,s)+c\,\nu)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{2\,i\,a\,k-i\,a\,m+p+2\,b\,s-b\,u+c\,\nu}{2\,c},\,\ldots,\,\frac{2\,i\,a\,k-i\,a\,m+p+2\,b\,s-b\,u+c\,\nu}{2\,c},\,\nu;\right.$$

$$\left.\frac{2\,i\,a\,k-i\,a\,m+p+2\,b\,s-b\,u+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{2\,i\,a\,k-i\,a\,m+p+2\,b\,s-b\,u+c\,\nu}{2\,c}+1;\,-e^{2\,c\,z}\right)+$$

$$e^{(a\,i\,(m-2\,k)+p+b\,(u-2\,s))\,z-\frac{i\,m\,\pi}{2}}\sum_{j=0}^{n}\frac{(-1)^{j}\,z^{n-j}\,(a\,i\,(m-2\,k)+p+b\,(u-2\,s)+c\,\nu)^{-j-1}}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\left(\frac{a\,i\,(m-2k)+p+b\,(u-2s)+c\,\nu}{2c},\,\ldots,\,\frac{a\,i\,(m-2k)+p+b\,(u-2s)+c\,\nu}{2c},\,\nu;\right. $$
$$ \frac{a\,i\,(m-2k)+p+b\,(u-2s)+c\,\nu}{2c}+1,\,\ldots,\,\frac{a\,i\,(m-2k)+p+b\,(u-2s)+c\,\nu}{2c}+ $$
$$ \left.\left.\left.1;\,-e^{2cz}\right)\right)\right)\operatorname{sech}^{\nu}(c\,z)\,/;\,n\in\mathbb{N}\bigwedge m\in\mathbb{N}^{+}\bigwedge u\in\mathbb{N}^{+} $$

Involving cos, cosh, exp and power

## Involving $z^n\,e^{p\,z}\cos(a\,z)\cosh(b\,z)\operatorname{sech}^{\nu}(c\,z)$

01.24.21.0609.01

$$ \int z^n\,e^{p\,z}\cos(a\,z)\cosh(b\,z)\operatorname{sech}^{\nu}(c\,z)\,dz = $$
$$ \frac{i}{4}\left(1+e^{2cz}\right)^{\nu} n!\operatorname{sech}^{\nu}(c\,z)\left(-e^{\frac{i\pi}{2}+(-b-i\,a+p)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(-b-i\,a+p+c\,\nu)^{-j-1}}{(n-j)!}\;{}_{j+2}F_{j+1}\right. $$
$$ \left(\frac{c\,\nu+p-i\,a-b}{2c},\,\ldots,\,\frac{c\,\nu+p-i\,a-b}{2c},\,\nu;\,\frac{c\,\nu+p-i\,a-b}{2c}+1,\,\ldots,\,\frac{c\,\nu+p-i\,a-b}{2c}+1;\,-e^{2cz}\right)+ $$
$$ e^{-\frac{1}{2}(i\pi)+(b+i\,a+p)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(b+i\,a+p+c\,\nu)^{-j-1}}{(n-j)!}\;{}_{j+2}F_{j+1}\left(\frac{c\,\nu+p+i\,a+b}{2c},\,\ldots,\,\frac{c\,\nu+p+i\,a+b}{2c},\right. $$
$$ \left.\nu;\,\frac{c\,\nu+p+i\,a+b}{2c}+1,\,\ldots,\,\frac{c\,\nu+p+i\,a+b}{2c}+1;\,-e^{2cz}\right)+ $$
$$ e^{-\frac{1}{2}(i\pi)+(b-i\,a+p)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(b-i\,a+p+c\,\nu)^{-j-1}}{(n-j)!}\;{}_{j+2}F_{j+1}\left(\frac{c\,\nu+p-i\,a+b}{2c},\,\ldots,\,\frac{c\,\nu+p-i\,a+b}{2c},\right. $$
$$ \left.\nu;\,\frac{c\,\nu+p-i\,a+b}{2c}+1,\,\ldots,\,\frac{c\,\nu+p-i\,a+b}{2c}+1;\,-e^{2cz}\right)- $$
$$ e^{\frac{i\pi}{2}+(-b+i\,a+p)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(-b+i\,a+p+c\,\nu)^{-j-1}}{(n-j)!}\;{}_{j+2}F_{j+1}\left(\frac{c\,\nu+p+i\,a-b}{2c},\,\ldots,\,\frac{c\,\nu+p+i\,a-b}{2c},\right. $$
$$ \left.\left.\nu;\,\frac{c\,\nu+p+i\,a-b}{2c}+1,\,\ldots,\,\frac{c\,\nu+p+i\,a-b}{2c}+1;\,-e^{2cz}\right)\right)\,/;\,n\in\mathbb{N} $$

Involving powers of cos, powers of cosh, exp and power

## Involving $z^n\,e^{p\,z}\cos^m(a\,z)\cosh^u(b\,z)\operatorname{sech}^{\nu}(c\,z)$

01.24.21.0610.01

$$\int z^n e^{pz}\cos^m(az)\cosh^u(bz)\operatorname{sech}^\nu(cz)\,dz = 2^{-m-u} e^{pz}\left(1+e^{2cz}\right)^\nu \binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}} n!\,(1-m \bmod 2)\,(1-u \bmod 2)$$
$$\left(\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(p+c\nu)^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{p+c\nu}{2c},\ldots,\frac{p+c\nu}{2c},\nu;\frac{p+c\nu}{2c}+1,\ldots,\frac{p+c\nu}{2c}+1;-e^{2cz}\right)\right)$$
$$\operatorname{sech}^\nu(cz) - 2^{-m-u}\binom{u}{\frac{u}{2}}(u \bmod 2-1)\,n!\left(1+e^{2cz}\right)^\nu$$
$$\left(\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(e^{(p-ia(m-2s))z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(p-ia(m-2s)+c\nu)^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{p-ia(m-2s)+c\nu}{2c},\ldots,\right.\right.\right.$$
$$\left.\frac{p-ia(m-2s)+c\nu}{2c},\nu;\frac{p-ia(m-2s)+c\nu}{2c}+1,\ldots,\frac{p-ia(m-2s)+c\nu}{2c}+1;-e^{2cz}\right)+$$
$$e^{(p+ai(m-2s))z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(p+ai(m-2s)+c\nu)^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{p+ia(m-2s)+c\nu}{2c},\ldots,\right.$$
$$\left.\left.\left.\frac{p+ia(m-2s)+c\nu}{2c},\nu;\frac{p+ia(m-2s)+c\nu}{2c}+1,\ldots,\frac{p+ia(m-2s)+c\nu}{2c}+1;-e^{2cz}\right)\right)\right)$$
$$\operatorname{sech}^\nu(cz) + 2^{-m-u}\left(1+e^{2cz}\right)^\nu\binom{m}{\frac{m}{2}} n!\,(1-m \bmod 2)\left(\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(e^{(p-b(u-2s))z}\right.\right.$$
$$\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(p-b(u-2s)+c\nu)^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{p-b(u-2s)+c\nu}{2c},\ldots,\right.$$
$$\left.\frac{p-b(u-2s)+c\nu}{2c},\nu;\frac{p-b(u-2s)+c\nu}{2c}+1,\ldots,\frac{p-b(u-2s)+c\nu}{2c}+1;-e^{2cz}\right)+$$
$$e^{(p+b(u-2s))z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(p+b(u-2s)+c\nu)^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{p+b(u-2s)+c\nu}{2c},\ldots,\right.$$
$$\left.\left.\left.\frac{p+b(u-2s)+c\nu}{2c},\nu;\frac{p+b(u-2s)+c\nu}{2c}+1,\ldots,\frac{p+b(u-2s)+c\nu}{2c}+1;-e^{2cz}\right)\right)\right)\operatorname{sech}^\nu(cz)+$$
$$2^{-m-u}\left(1+e^{2cz}\right)^\nu n!\left(\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\binom{u}{s}\left(e^{(-ia(m-2k)+p-b(u-2s))z}\sum_{j=0}^{n}\frac{\left((-1)^j z^{n-j}(-ia(m-2k)+p-b(u-2s)+c\nu)^{-j-1}\right)}{(n-j)!}\right.\right.$$
$${}_{j+2}F_{j+1}\!\left(\frac{-ia(m-2k)+p-b(u-2s)+c\nu}{2c},\ldots,\frac{-ia(m-2k)+p-b(u-2s)+c\nu}{2c},\nu;\right.$$
$$\left.\frac{-ia(m-2k)+p-b(u-2s)+c\nu}{2c}+1,\ldots,\frac{-ia(m-2k)+p-b(u-2s)+c\nu}{2c}+1;-e^{2cz}\right)+$$

$$e^{(a i (m-2k)+p-b(u-2s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (a i (m-2k)+p-b(u-2s)+c\nu)^{-j-1}\right)}{(n-j)!}$$
$$ {}_{j+2}F_{j+1}\left(\frac{i a (m-2k)+p-b(u-2s)+c\nu}{2c}, \ldots, \frac{i a (m-2k)+p-b(u-2s)+c\nu}{2c}, \nu; \right.$$
$$\left. \frac{i a (m-2k)+p-b(u-2s)+c\nu}{2c}+1, \ldots, \frac{i a (m-2k)+p-b(u-2s)+c\nu}{2c}+1; -e^{2cz}\right) +$$
$$e^{(-i a (m-2k)+p+b(u-2s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (-i a (m-2k)+p+b(u-2s)+c\nu)^{-j-1}\right)}{(n-j)!}$$
$$ {}_{j+2}F_{j+1}\left(\frac{-i a (m-2k)+p+b(u-2s)+c\nu}{2c}, \ldots, \frac{-i a (m-2k)+p+b(u-2s)+c\nu}{2c}, \nu; \right.$$
$$\left. \frac{-i a (m-2k)+p+b(u-2s)+c\nu}{2c}+1, \ldots, \frac{-i a (m-2k)+p+b(u-2s)+c\nu}{2c}+1; -e^{2cz}\right) +$$
$$e^{(a i (m-2k)+p+b(u-2s)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (a i (m-2k)+p+b(u-2s)+c\nu)^{-j-1}\right)}{(n-j)!}$$
$$ {}_{j+2}F_{j+1}\left(\frac{i a (m-2k)+p+b(u-2s)+c\nu}{2c}, \ldots, \frac{i a (m-2k)+p+b(u-2s)+c\nu}{2c}, \nu; \right.$$
$$\frac{i a (m-2k)+p+b(u-2s)+c\nu}{2c}+1, \ldots, \frac{i a (m-2k)+p+b(u-2s)+c\nu}{2c}+$$
$$\left.\left.\left. 1; -e^{2cz}\right)\right)\right) \operatorname{sech}^{\nu}(c z) /; n \in \mathbb{N} \wedge m \in \mathbb{N}^+ \wedge u \in \mathbb{N}^+$$

## Involving sin, tanh, exp and power

### Involving $z^n e^{p z} \sin(a z) \tanh(c z) \operatorname{sech}^{\nu}(c z)$

01.24.21.0611.01

$$\int z^n e^{p z} \sin(a z) \tanh(c z) \operatorname{sech}^\nu(c z)\, dz = \frac{1}{4}\left(1+e^{2 c z}\right)^{\nu+1} n! \operatorname{sech}^{\nu+1}(c z)\left(-e^{\frac{i\pi}{2}+(-c-i a+p) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (-i a+p+c\nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{-i a+p+c\nu}{2c}, \ldots, \frac{-i a+p+c\nu}{2c}, \nu+1; \frac{-i a+p+c\nu}{2c}+1, \ldots, \frac{-i a+p+c\nu}{2c}+1; -e^{2 c z}\right) + e^{\frac{i\pi}{2}+(-c+i a+p) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (i a+p+c\nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a+p+c\nu}{2c}, \ldots, \frac{i a+p+c\nu}{2c}, \nu+1; \frac{i a+p+c\nu}{2c}+1, \ldots, \frac{i a+p+c\nu}{2c}+1; -e^{2 c z}\right) - e^{-\frac{1}{2}(i\pi)+(c-i a+p) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (-i a+p+c(\nu+2))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{-i a+p+c(\nu+2)}{2c}, \ldots, \frac{-i a+p+c(\nu+2)}{2c}, \nu+1; \frac{-i a+p+c(\nu+2)}{2c}+1, \ldots, \frac{-i a+p+c(\nu+2)}{2c}+1; -e^{2 c z}\right) + e^{-\frac{1}{2}(i\pi)+(c+i a+p) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (i a+p+c(\nu+2))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a+p+c(\nu+2)}{2c}, \ldots, \frac{i a+p+c(\nu+2)}{2c}, \nu+1; \frac{i a+p+c(\nu+2)}{2c}+1, \ldots, \frac{i a+p+c(\nu+2)}{2c}+1; -e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

## Involving powers of sin, powers of tanh, exp and power

### Involving $z^n e^{p z} \sin^m(a z) \tanh^u(c z) \operatorname{sech}^\nu(c z)$

01.24.21.0612.01

$$\int z^n e^{p z} \sin^m(a z) \tanh^u(c z) \operatorname{sech}^\nu(c z)\, dz = i^u 2^{-m-u} e^{p z} \left(1+e^{2 c z}\right)^{u+\nu} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! (1 - m \bmod 2)(1 - u \bmod 2) \operatorname{sech}^{u+\nu}(c z) \sum_{j=0}^n \frac{\left((-1)^j z^{n-j} (p+c(u+\nu))^{-j-1}\right)}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{p+c(u+\nu)}{2c}, \ldots, \frac{p+c(u+\nu)}{2c}, u+\nu; \frac{p+c(u+\nu)}{2c}+1, \ldots, \frac{p+c(u+\nu)}{2c}+1; -e^{2 c z}\right) + \left(\frac{i}{2}\right)^{m+u} \binom{u}{\frac{u}{2}} (1 - u \bmod 2)\, n! \operatorname{sech}^{u+\nu}(c z) \left(1+e^{2 c z}\right)^{u+\nu} \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left(e^{(p-i a(m-2k)) z} \sum_{j=0}^n \frac{\left((-1)^j z^{n-j} (a i(2k-m)+p+c(u+\nu))^{-j-1}\right)}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a(2k-m)+p+c(u+\nu)}{2c}, \ldots, \frac{i a(2k-m)+p+c(u+\nu)}{2c}, u+\nu; \frac{i a(2k-m)+p+c(u+\nu)}{2c}+1, \ldots, \frac{i a(2k-m)+p+c(u+\nu)}{2c}+1; -e^{2 c z}\right) + (-1)^m e^{(a i(m-2k)+p) z} \sum_{j=0}^n \frac{\left((-1)^j z^{n-j} (a i(m-2k)+p+c(u+\nu))^{-j-1}\right)}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a(m-2k)+p+c(u+\nu)}{2c}, \ldots, \frac{i a(m-2k)+p+c(u+\nu)}{2c}, u+\nu;\right.$$

$$\frac{i\,a\,(m-2\,k)+p+c\,(u+v)}{2\,c}+1,\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(u+v)}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)\Bigg)+2^{-m-u}\binom{m}{\frac{m}{2}}$$

$$(1-m \bmod 2)\left(1+e^{2\,c\,z}\right)^{u+v} n!\,\text{sech}^{u+v}(c\,z)\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}\Bigg((-1)^u\,e^{(p-c\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(p+c\,(2\,s+v))^{-j-1}\right)}{(n-j)!}$$

$$_{j+2}F_{j+1}\left(\frac{1}{2}\left(\frac{p}{c}+2\,s+v\right),\,\ldots,\,\frac{1}{2}\left(\frac{p}{c}+2\,s+v\right),\,u+v;\,\frac{1}{2}\left(\frac{p}{c}+2\,s+v\right)+1,\,\ldots,\,\frac{1}{2}\left(\frac{p}{c}+2\,s+v\right)+1;\,-e^{2\,c\,z}\right)+$$

$$e^{(p+c\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(p+c\,(-2\,s+2\,u+v))^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\Bigg(\frac{1}{2}\left(\frac{p}{c}-2\,s+2\,u+v\right),\,\ldots,$$

$$\frac{1}{2}\left(\frac{p}{c}-2\,s+2\,u+v\right),\,u+v;\,\frac{1}{2}\left(\frac{p}{c}-2\,s+2\,u+v\right)+1,\,\ldots,\,\frac{1}{2}\left(\frac{p}{c}-2\,s+2\,u+v\right)+1;\,-e^{2\,c\,z}\Bigg)\Bigg)+$$

$$2^{-m-u}\left(1+e^{2\,c\,z}\right)^{u+v} n!\,\text{sech}^{u+v}(c\,z)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^s\binom{u}{s}\Bigg((-1)^u\,e^{\frac{i\pi m}{2}+(-i\,a\,(m-2\,k)+p-c\,(u-2\,s))\,z}$$

$$\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(2\,i\,a\,k-i\,a\,m+p+2\,c\,s+c\,v)^{-j-1}\right)}{(n-j)!}$$

$$_{j+2}F_{j+1}\Bigg(\frac{2\,i\,a\,k-i\,a\,m+p+2\,c\,s+c\,v}{2\,c},\,\ldots,\,\frac{2\,i\,a\,k-i\,a\,m+p+2\,c\,s+c\,v}{2\,c},\,u+$$

$$v;\,\frac{2\,i\,a\,k-i\,a\,m+p+2\,c\,s+c\,v}{2\,c}+1,\,\ldots,\,\frac{2\,i\,a\,k-i\,a\,m+p+2\,c\,s+c\,v}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+$$

$$(-1)^u\,e^{(a\,i\,(m-2\,k)+p-c\,(u-2\,s))\,z-\frac{i\,m\,\pi}{2}}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(-2\,a\,i\,k+i\,a\,m+p+2\,c\,s+c\,v)^{-j-1}\right)}{(n-j)!}$$

$$_{j+2}F_{j+1}\Bigg(\frac{-2\,i\,a\,k+i\,a\,m+p+2\,c\,s+c\,v}{2\,c},\,\ldots,\,\frac{-2\,i\,a\,k+i\,a\,m+p+2\,c\,s+c\,v}{2\,c},\,u+$$

$$v;\,\frac{-2\,i\,a\,k+i\,a\,m+p+2\,c\,s+c\,v}{2\,c}+1,\,\ldots,\,\frac{-2\,i\,a\,k+i\,a\,m+p+2\,c\,s+c\,v}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+$$

$$e^{\frac{i\pi m}{2}+(-i\,a\,(m-2\,k)+p+c\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(a\,i\,(2\,k-m)+p+c\,(-2\,s+2\,u+v))^{-j-1}\right)}{(n-j)!}$$

$$_{j+2}F_{j+1}\Bigg(\frac{i\,a\,(2\,k-m)+p+c\,(-2\,s+2\,u+v)}{2\,c},\,\ldots,\,\frac{i\,a\,(2\,k-m)+p+c\,(-2\,s+2\,u+v)}{2\,c},\,u+v;$$

$$\frac{i\,a\,(2\,k-m)+p+c\,(-2\,s+2\,u+v)}{2\,c}+1,\,\ldots,\,\frac{i\,a\,(2\,k-m)+p+c\,(-2\,s+2\,u+v)}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+$$

$$e^{(a\,i\,(m-2\,k)+p+c\,(u-2\,s))\,z-\frac{i\,m\,\pi}{2}}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(a\,i\,(m-2\,k)+p+c\,(-2\,s+2\,u+v))^{-j-1}\right)}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\left(\frac{i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+v)}{2\,c},\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+v)}{2\,c},\right. $$
$$ u+v;\,\frac{i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+v)}{2\,c}+1,\,\ldots, $$
$$ \left.\left.\frac{i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+v)}{2\,c}+1;\,-e^{2\,c\,z}\right)\right)\,/;\,n\in\mathbb{N}\bigwedge m\in\mathbb{N}^+\bigwedge u\in\mathbb{N}^+ $$

Involving cos, tanh, exp and power

## Involving $z^n\,e^{p\,z}\cos(a\,z)\tanh(c\,z)\operatorname{sech}^{\nu}(c\,z)$

01.24.21.0613.01

$$ \int z^n\,e^{p\,z}\cos(a\,z)\tanh(c\,z)\operatorname{sech}^{\nu}(c\,z)\,dz = $$
$$ \frac{1}{4}\left(1+e^{2\,c\,z}\right)^{\nu+1} n!\operatorname{sech}^{\nu+1}(c\,z)\left(-e^{(-c-i\,a+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(-i\,a+p+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{-i\,a+p+c\,\nu}{2\,c},\,\ldots,\,\frac{-i\,a+p+c\,\nu}{2\,c},\right.\right. $$
$$ \left.\nu+1;\,\frac{-i\,a+p+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{-i\,a+p+c\,\nu}{2\,c}+1;\,-e^{2\,c\,z}\right)-e^{(-c+i\,a+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(i\,a+p+c\,\nu)^{-j-1}}{(n-j)!} $$
$$ {}_{j+2}F_{j+1}\left(\frac{i\,a+p+c\,\nu}{2\,c},\,\ldots,\,\frac{i\,a+p+c\,\nu}{2\,c},\,\nu+1;\,\frac{i\,a+p+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{i\,a+p+c\,\nu}{2\,c}+1;\,-e^{2\,c\,z}\right)+ $$
$$ e^{(c-i\,a+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(-i\,a+p+c\,(\nu+2))^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{-i\,a+p+c\,(\nu+2)}{2\,c},\,\ldots,\,\frac{-i\,a+p+c\,(\nu+2)}{2\,c},\right. $$
$$ \left.\nu+1;\,\frac{-i\,a+p+c\,(\nu+2)}{2\,c}+1,\,\ldots,\,\frac{-i\,a+p+c\,(\nu+2)}{2\,c}+1;\,-e^{2\,c\,z}\right)+ $$
$$ e^{(c+i\,a+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(i\,a+p+c\,(\nu+2))^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{i\,a+p+c\,(\nu+2)}{2\,c},\,\ldots,\,\frac{i\,a+p+c\,(\nu+2)}{2\,c},\right. $$
$$ \left.\left.\nu+1;\,\frac{i\,a+p+c\,(\nu+2)}{2\,c}+1,\,\ldots,\,\frac{i\,a+p+c\,(\nu+2)}{2\,c}+1;\,-e^{2\,c\,z}\right)\right)\,/;\,n\in\mathbb{N} $$

Involving powers of cos, powers of tanh, exp and power

## Involving $z^n\,e^{p\,z}\cos^m(a\,z)\tanh^u(c\,z)\operatorname{sech}^{\nu}(c\,z)$

01.24.21.0614.01

$$ \int z^n\,e^{p\,z}\cos^m(a\,z)\tanh^u(c\,z)\operatorname{sech}^{\nu}(c\,z)\,dz = $$
$$ i^u\,2^{-m-u}\,e^{p\,z}\left(1+e^{2\,c\,z}\right)^{u+\nu}\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}n!\,(1-m\bmod 2)\,(1-u\bmod 2)\operatorname{sech}^{u+\nu}(c\,z)\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(p+c\,(u+\nu))^{-j-1}\right)}{(n-j)!} $$
$$ {}_{j+2}F_{j+1}\left(\frac{p+c\,(u+\nu)}{2\,c},\,\ldots,\,\frac{p+c\,(u+\nu)}{2\,c},\,u+\nu;\,\frac{p+c\,(u+\nu)}{2\,c}+1,\,\ldots,\,\frac{p+c\,(u+\nu)}{2\,c}+1;\,-e^{2\,c\,z}\right)- $$

$$i^u\, 2^{-m-u} \binom{u}{\frac{u}{2}} (u \bmod 2 - 1)\, n!\, \operatorname{sech}^{u+v}(c\, z) \left(1 + e^{2cz}\right)^{u+v}$$

$$\sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \left( e^{(p-i\,a\,(m-2s))z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (p - i\,a\,(m-2s) + c\,(u+v))^{-j-1}\right)}{(n-j)!}\; {}_{j+2}F_{j+1}\left( \frac{p - i\,a\,(m-2s) + c\,(u+v)}{2c}, \ldots, \right.\right.$$

$$\frac{p - i\,a\,(m-2s) + c\,(u+v)}{2c}, u+v; \frac{p - i\,a\,(m-2s) + c\,(u+v)}{2c} + 1, \ldots, \frac{p - i\,a\,(m-2s) + c\,(u+v)}{2c} + 1;$$

$$\left. -e^{2cz} \right) + e^{(p+a\,i\,(m-2s))z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (p + a\,i\,(m-2s) + c\,(u+v))^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left( \frac{p + i\,a\,(m-2s) + c\,(u+v)}{2c}, \ldots, \frac{p + i\,a\,(m-2s) + c\,(u+v)}{2c}, u+v; \frac{p + i\,a\,(m-2s) + c\,(u+v)}{2c} + 1, \right.$$

$$\left.\left. \ldots, \frac{p + i\,a\,(m-2s) + c\,(u+v)}{2c} + 1; -e^{2cz} \right) \right) + 2^{-m-u} \binom{m}{\frac{m}{2}} (1 - m \bmod 2)$$

$$n!\, \operatorname{sech}^{u+v}(c\, z) \left(1 + e^{2cz}\right)^{u+v} \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{u}{k} \left( (-1)^u e^{(p-c\,(u-2k))z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c\,(2k+v) + p)^{-j-1}\right)}{(n-j)!} \right.$$

$${}_{j+2}F_{j+1}\left( \frac{p + c\,(2k+v)}{2c}, \ldots, \frac{p + c\,(2k+v)}{2c}, u+v; \frac{p + c\,(2k+v)}{2c} + 1, \ldots, \frac{p + c\,(2k+v)}{2c} + 1; -e^{2cz} \right) +$$

$$e^{(p+c\,(u-2k))z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c\,(-2k + 2u + v) + p)^{-j-1}\right)}{(n-j)!}\; {}_{j+2}F_{j+1}\left( \frac{p + c\,(-2k + 2u + v)}{2c}, \ldots, \right.$$

$$\left.\left. \frac{p + c\,(-2k + 2u + v)}{2c}, u+v; \frac{p + c\,(-2k + 2u + v)}{2c} + 1, \ldots, \frac{p + c\,(-2k + 2u + v)}{2c} + 1; -e^{2cz} \right) \right) +$$

$$2^{-m-u}\, n!\, \operatorname{sech}^{u+v}(c\, z) \left(1 + e^{2cz}\right)^{u+v} \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{s} \binom{u}{k} \left( (-1)^u e^{(p-i\,a\,(m-2s)-c\,(u-2k))z} \right.$$

$$\sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c\,(2k+v) + p - i\,a\,(m-2s))^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left( \frac{p - i\,a\,(m-2s) + c\,(2k+v)}{2c}, \ldots, \frac{p - i\,a\,(m-2s) + c\,(2k+v)}{2c}, u+v; \right.$$

$$\left. \frac{p - i\,a\,(m-2s) + c\,(2k+v)}{2c} + 1, \ldots, \frac{p - i\,a\,(m-2s) + c\,(2k+v)}{2c} + 1; -e^{2cz} \right) +$$

$$(-1)^u e^{(p+a\,i\,(m-2s)-c\,(u-2k))z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c\,(2k+v) + p + a\,i\,(m-2s))^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left( \frac{p + i\,a\,(m-2s) + c\,(2k+v)}{2c}, \ldots, \frac{p + i\,a\,(m-2s) + c\,(2k+v)}{2c}, u+v; \right.$$

$$\left. \frac{p + i\,a\,(m-2s) + c\,(2k+v)}{2c} + 1, \ldots, \frac{p + i\,a\,(m-2s) + c\,(2k+v)}{2c} + 1; -e^{2cz} \right) +$$

$$e^{(p-i a (m-2 s)+c (u-2 k)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c (-2 k+2 u+v)+p-i a (m-2 s))^{-j-1}\right)}{(n-j)!}$$
$$_{j+2}F_{j+1}\left(\frac{p-i a (m-2 s)+c (-2 k+2 u+v)}{2 c}, \ldots, \frac{p-i a (m-2 s)+c (-2 k+2 u+v)}{2 c}, u+v;\right.$$
$$\left.\frac{p-i a (m-2 s)+c (-2 k+2 u+v)}{2 c}+1, \ldots, \frac{p-i a (m-2 s)+c (-2 k+2 u+v)}{2 c}+1; -e^{2 c z}\right)+$$
$$e^{(p+a i (m-2 s)+c (u-2 k)) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c (-2 k+2 u+v)+p+a i (m-2 s))^{-j-1}\right)}{(n-j)!}$$
$$_{j+2}F_{j+1}\left(\frac{p+i a (m-2 s)+c (-2 k+2 u+v)}{2 c}, \ldots, \frac{p+i a (m-2 s)+c (-2 k+2 u+v)}{2 c},\right.$$
$$u+v; \frac{p+i a (m-2 s)+c (-2 k+2 u+v)}{2 c}+1, \ldots,$$
$$\left.\left.\frac{p+i a (m-2 s)+c (-2 k+2 u+v)}{2 c}+1; -e^{2 c z}\right)\right) /; n \in \mathbb{N} \wedge m \in \mathbb{N}^+ \wedge u \in \mathbb{N}^+$$

## Involving powers of sin, powers of coth, exp and power

### Involving $z^n e^{p z} \sin^m(a z) \coth^u(c z) \operatorname{sech}^v(c z)$

01.24.21.0615.01

$$\int z^n e^{p z} \sin^m(a z) \coth^u(c z) \operatorname{sech}^v(c z) \, dz = (-1)^u 2^{v-m} \binom{m}{\frac{m}{2}} n! (1-m \bmod 2) \left(e^{(p+c u) z} \binom{u-v}{\frac{u-v}{2}} (1-(u-v) \bmod 2)\right.$$
$$\sum_{j=0}^{n} \frac{(-1)^j (p+c u)^{-j-1} z^{n-j}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{p+c u}{2 c}, \ldots, \frac{p+c u}{2 c}, u; \frac{p+c u}{2 c}+1, \ldots, \frac{p+c u}{2 c}+1; e^{2 c z}\right)+$$
$$e^{c u z} \sum_{k=0}^{\left\lfloor \frac{1}{2}(u-v-1)\right\rfloor} \binom{u-v}{k} \left(e^{(p+c (-2 k+u-v)) z} \sum_{j=0}^{n} \frac{(-1)^j (p+c (-2 k+2 u-v))^{-j-1} z^{n-j}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{p+c (-2 k+2 u-v)}{2 c},\right.\right.$$
$$\left.\ldots, \frac{p+c (-2 k+2 u-v)}{2 c}, u; \frac{p+c (-2 k+2 u-v)}{2 c}+1, \ldots, \frac{p+c (-2 k+2 u-v)}{2 c}+1; e^{2 c z}\right)+$$
$$e^{(p-c (-2 k+u-v)) z} \sum_{j=0}^{n} \frac{(-1)^j (p+c (2 k+v))^{-j-1} z^{n-j}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{p+c (2 k+v)}{2 c}, \ldots, \frac{p+c (2 k+v)}{2 c},\right.$$
$$\left.\left.\left. u; \frac{p+c (2 k+v)}{2 c}+1, \ldots, \frac{p+c (2 k+v)}{2 c}+1; e^{2 c z}\right)\right)\right)+$$
$$(-1)^u 2^{v-m} n! \sum_{s=0}^{\left\lfloor \frac{m-1}{2}\right\rfloor} (-1)^s \binom{m}{s} \left(e^{\frac{i m \pi}{2}} \left(e^{(-i a (m-2 s)+p+c u) z} \binom{u-v}{\frac{u-v}{2}} (1-(u-v) \bmod 2)\right.\right.$$

$$\sum_{j=0}^{n} \frac{(-1)^j \left(-i\, a\, (m-2\, s)+p+c\, u\right)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\!\left(\frac{p-i\, a\, (m-2\, s)+c\, u}{2\, c}, \ldots, \frac{p-i\, a\, (m-2\, s)+c\, u}{2\, c}, u; \frac{p-i\, a\, (m-2\, s)+c\, u}{2\, c}+1, \ldots, \frac{p-i\, a\, (m-2\, s)+c\, u}{2\, c}+1; e^{2\, c\, z}\right) +$$

$$e^{c\, u\, z} \sum_{k=0}^{\left\lfloor \frac{1}{2}(u-v-1) \right\rfloor} \binom{u-v}{k} \left(e^{(-i\, a\, (m-2\, s)+p+c\, (-2\, k+u-v))\, z} \sum_{j=0}^{n} \frac{(-1)^j \left(-i\, a\, (m-2\, s)+p+c\, (-2\, k+2\, u-v)\right)^{-j-1} z^{n-j}}{(n-j)!} \right.$$

$${}_{j+2}F_{j+1}\!\left(\frac{p-i\, a\, (m-2\, s)+c\, (-2\, k+2\, u-v)}{2\, c}, \ldots, \frac{p-i\, a\, (m-2\, s)+c\, (-2\, k+2\, u-v)}{2\, c}, u; \frac{p-i\, a\, (m-2\, s)+c\, (-2\, k+2\, u-v)}{2\, c}+1, \ldots, \frac{p-i\, a\, (m-2\, s)+c\, (-2\, k+2\, u-v)}{2\, c}+1; e^{2\, c\, z}\right) + e^{(-i\, a\, (m-2\, s)+p-c\, (-2\, k+u-v))\, z} \sum_{j=0}^{n} \frac{(-1)^j \left(-i\, a\, (m-2\, s)+p+c\, (2\, k+v)\right)^{-j-1} z^{n-j}}{(n-j)!}$$

$$\left. {}_{j+2}F_{j+1}\!\left(\frac{p-i\, a\, (m-2\, s)+c\, (2\, k+v)}{2\, c}, \ldots, \frac{p-i\, a\, (m-2\, s)+c\, (2\, k+v)}{2\, c}, u; \frac{p-i\, a\, (m-2\, s)+c\, (2\, k+v)}{2\, c}+1, \ldots, \frac{p-i\, a\, (m-2\, s)+c\, (2\, k+v)}{2\, c}+1; e^{2\, c\, z}\right)\right)\Bigg) +$$

$$e^{-\frac{1}{2}\, i\, m\, \pi} \Bigg( e^{(a\, i\, (m-2\, s)+p+c\, u)\, z} \binom{u-v}{\frac{u-v}{2}} (1-(u-v) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j \left(a\, i\, (m-2\, s)+p+c\, u\right)^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\!\left(\frac{p+i\, a\, (m-2\, s)+c\, u}{2\, c}, \ldots, \frac{p+i\, a\, (m-2\, s)+c\, u}{2\, c}, u; \frac{p+i\, a\, (m-2\, s)+c\, u}{2\, c}+1, \ldots, \frac{p+i\, a\, (m-2\, s)+c\, u}{2\, c}+1; e^{2\, c\, z}\right) +$$

$$e^{c\, u\, z} \sum_{k=0}^{\left\lfloor \frac{1}{2}(u-v-1) \right\rfloor} \binom{u-v}{k} \left(e^{(a\, i\, (m-2\, s)+p+c\, (-2\, k+u-v))\, z} \sum_{j=0}^{n} \frac{(-1)^j \left(a\, i\, (m-2\, s)+p+c\, (-2\, k+2\, u-v)\right)^{-j-1} z^{n-j}}{(n-j)!} \right.$$

$${}_{j+2}F_{j+1}\!\left(\frac{p+i\, a\, (m-2\, s)+c\, (-2\, k+2\, u-v)}{2\, c}, \ldots, \frac{p+i\, a\, (m-2\, s)+c\, (-2\, k+2\, u-v)}{2\, c}, u; \frac{p+i\, a\, (m-2\, s)+c\, (-2\, k+2\, u-v)}{2\, c}+1, \ldots, \frac{p+i\, a\, (m-2\, s)+c\, (-2\, k+2\, u-v)}{2\, c}+1; e^{2\, c\, z}\right) + e^{(a\, i\, (m-2\, s)+p-c\, (-2\, k+u-v))\, z}$$

$$\left. \sum_{j=0}^{n} \frac{(-1)^j \left(a\, i\, (m-2\, s)+p+c\, (2\, k+v)\right)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\!\left(\frac{p+i\, a\, (m-2\, s)+c\, (2\, k+v)}{2\, c}, \ldots, \frac{p+i\, a\, (m-2\, s)+c\, (2\, k+v)}{2\, c}, u; \frac{p+i\, a\, (m-2\, s)+c\, (2\, k+v)}{2\, c}+1, \ldots, \frac{p+i\, a\, (m-2\, s)+c\, (2\, k+v)}{2\, c}+1; e^{2\, c\, z}\right)\right)\Bigg)\Bigg) \,/;\, n \in \mathbb{N} \bigwedge m \in \mathbb{N}^+ \bigwedge u \in \mathbb{Z} \bigwedge u \geq v \bigwedge v \in \mathbb{N}^+$$

Involving powers of cos, powers of coth, exp and power

## Involving $z^n e^{p z} \cos^m(a z) \coth^u(c z) \operatorname{sech}^\nu(c z)$

01.24.21.0616.01

$$\int z^n e^{p z} \cos^m(a z) \coth^u(c z) \operatorname{sech}^\nu(c z)\, dz = (-1)^u 2^{\nu-m} \binom{m}{\frac{m}{2}} n!\,(1 - m \bmod 2) \Bigg( e^{(p+c u) z} \binom{u-\nu}{\frac{u-\nu}{2}} (1 - (u-\nu) \bmod 2)$$

$$\sum_{j=0}^{n} \frac{(-1)^j (p+c u)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{p+c u}{2 c}, \ldots, \frac{p+c u}{2 c}, u; \frac{p+c u}{2 c}+1, \ldots, \frac{p+c u}{2 c}+1; e^{2 c z}\right) +$$

$$e^{c u z} \sum_{k=0}^{\left\lfloor \frac{1}{2}(u-\nu-1) \right\rfloor} \binom{u-\nu}{k} \Bigg( e^{(p+c(-2k+u-\nu)) z} \sum_{j=0}^{n} \frac{(-1)^j (p+c(-2k+2u-\nu))^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\Bigg(\frac{p+c(-2k+2u-\nu)}{2c},$$

$$\ldots, \frac{p+c(-2k+2u-\nu)}{2c}, u; \frac{p+c(-2k+2u-\nu)}{2c}+1, \ldots, \frac{p+c(-2k+2u-\nu)}{2c}+1; e^{2 c z}\Bigg) +$$

$$e^{(p-c(-2k+u-\nu)) z} \sum_{j=0}^{n} \frac{(-1)^j (p+c(2k+\nu))^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\Bigg(\frac{p+c(2k+\nu)}{2c}, \ldots, \frac{p+c(2k+\nu)}{2c},$$

$$u; \frac{p+c(2k+\nu)}{2c}+1, \ldots, \frac{p+c(2k+\nu)}{2c}+1; e^{2 c z}\Bigg)\Bigg)\Bigg) +$$

$$(-1)^u 2^{\nu-m} n! \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \Bigg( e^{(-i a (m-2s)+p+c u) z} \binom{u-\nu}{\frac{u-\nu}{2}} (1 - (u-\nu) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (-i a (m-2s)+p+c u)^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{p-i a (m-2s)+c u}{2c}, \ldots, \frac{p-i a (m-2s)+c u}{2c}, u; \frac{p-i a (m-2s)+c u}{2c}+1,$$

$$\ldots, \frac{p-i a (m-2s)+c u}{2c}+1; e^{2 c z}\Bigg) + e^{(a i (m-2s)+p+c u) z} \binom{u-\nu}{\frac{u-\nu}{2}}$$

$$(1-(u-\nu) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (a i (m-2s)+p+c u)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\Bigg(\frac{p+i a (m-2s)+c u}{2c}, \ldots,$$

$$\frac{p+i a (m-2s)+c u}{2c}, u; \frac{p+i a (m-2s)+c u}{2c}+1, \ldots, \frac{p+i a (m-2s)+c u}{2c}+1; e^{2 c z}\Bigg) +$$

$$e^{c u z} \sum_{k=0}^{\left\lfloor \frac{1}{2}(u-\nu-1) \right\rfloor} \binom{u-\nu}{k} \Bigg( e^{(-i a (m-2s)+p+c(-2k+u-\nu)) z} \sum_{j=0}^{n} \frac{(-1)^j (-i a (m-2s)+p+c(-2k+2u-\nu))^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{p-i a (m-2s)+c(-2k+2u-\nu)}{2c}, \ldots, \frac{p-i a (m-2s)+c(-2k+2u-\nu)}{2c}, u;$$

$$\frac{p-i a (m-2s)+c(-2k+2u-\nu)}{2c}+1, \ldots, \frac{p-i a (m-2s)+c(-2k+2u-\nu)}{2c}+1; e^{2 c z}\Bigg) +$$

$$e^{(-i a (m-2 s)+p-c(-2 k+u-v)) z} \sum_{j=0}^{n} \frac{(-1)^j (-i a (m-2 s)+p+c(2 k+v))^{-j-1} z^{n-j}}{(n-j)!}$$
$$_{j+2}F_{j+1}\left(\frac{p-i a (m-2 s)+c(2 k+v)}{2 c}, \ldots, \frac{p-i a (m-2 s)+c(2 k+v)}{2 c}, u; \frac{p-i a (m-2 s)+c(2 k+v)}{2 c}+1, \ldots, \frac{p-i a (m-2 s)+c(2 k+v)}{2 c}+1; e^{2 c z}\right)\Bigg)+$$
$$e^{c u z} \sum_{k=0}^{\left\lfloor \frac{1}{2}(u-v-1)\right\rfloor} \binom{u-v}{k} \Bigg(e^{(a i (m-2 s)+p+c(-2 k+u-v)) z} \sum_{j=0}^{n} \frac{(-1)^j (a i (m-2 s)+p+c(-2 k+2 u-v))^{-j-1} z^{n-j}}{(n-j)!}$$
$$_{j+2}F_{j+1}\left(\frac{p+i a (m-2 s)+c(-2 k+2 u-v)}{2 c}, \ldots, \frac{p+i a (m-2 s)+c(-2 k+2 u-v)}{2 c}, u; \frac{p+i a (m-2 s)+c(-2 k+2 u-v)}{2 c}+1, \ldots, \frac{p+i a (m-2 s)+c(-2 k+2 u-v)}{2 c}+1; e^{2 c z}\right)+$$
$$e^{(a i (m-2 s)+p-c(-2 k+u-v)) z} \sum_{j=0}^{n} \frac{(-1)^j (a i (m-2 s)+p+c(2 k+v))^{-j-1} z^{n-j}}{(n-j)!}$$
$$_{j+2}F_{j+1}\left(\frac{p+i a (m-2 s)+c(2 k+v)}{2 c}, \ldots, \frac{p+i a (m-2 s)+c(2 k+v)}{2 c}, u; \frac{p+i a (m-2 s)+c(2 k+v)}{2 c}+1, \ldots, \frac{p+i a (m-2 s)+c(2 k+v)}{2 c}+1; e^{2 c z}\right)\Bigg)\Bigg) /; n \in \mathbb{N} \land m \in \mathbb{N}^+ \land u \in \mathbb{Z} \land u \geq v \land v \in \mathbb{N}^+$$

## Definite integration

### For the direct function itself

01.24.21.0015.01

$$\int_0^\infty \operatorname{sech}(t)\, dt = \frac{\pi}{2}$$

01.24.21.0016.01

$$\int_0^\infty t \operatorname{sech}(t)\, dt = 2 C$$

01.24.21.0017.01

$$\int_0^\infty t^2 \operatorname{sech}(t)\, dt = \frac{\pi^3}{8}$$

01.24.21.0018.01

$$\int_0^\infty t^3 \operatorname{sech}(t)\, dt = 6 i (\operatorname{Li}_4(-i) - \operatorname{Li}_4(i))$$

### Involving the direct function

01.24.21.0019.01

$$\int_0^\infty e^{-t} \operatorname{sech}(t) \, dt = \log(2)$$

01.24.21.0020.01

$$\int_0^\infty t \, e^{-t} \operatorname{sech}(t) \, dt = \frac{\pi^2}{24}$$

01.24.21.0021.01

$$\int_0^\infty t^2 \, e^{-t} \operatorname{sech}(t) \, dt = \frac{3 \zeta(3)}{8}$$

01.24.21.0022.01

$$\int_0^\infty t^3 \, e^{-t} \operatorname{sech}(t) \, dt = \frac{7 \pi^4}{960}$$

## Summation

### Finite summation

01.24.23.0001.01

$$\sum_{k=0}^{n-1} \operatorname{sech}^2\left(\frac{i \pi k}{n} + z\right) = -n^2 \operatorname{csch}^2\left(\frac{1}{2} n (2 z + \pi i)\right) /; n \in \mathbb{N}^+$$

01.24.23.0002.01

$$\sum_{k=0}^{n-1} \operatorname{sech}^2\left(\frac{2 i \pi k}{n} + z\right) = -\frac{1}{2} (1 - (-1)^n) n^2 \operatorname{csch}^2\left(\frac{1}{2} n (2 z + \pi i)\right) - \frac{1}{4} (1 + (-1)^n) n^2 \operatorname{csch}^2\left(\frac{1}{4} n (2 z + \pi i)\right) /; n \in \mathbb{N}^+$$

01.24.23.0003.01

$$\sum_{k=1}^{n} \frac{1}{2^{2 k}} \operatorname{sech}^2\left(\frac{z}{2^k}\right) = \frac{1}{2^{2 n}} \operatorname{csch}^2\left(\frac{z}{2^n}\right) - \operatorname{csch}^2(z)$$

### Infinite summation

01.24.23.0004.01

$$\sum_{k=1}^{\infty} \frac{1}{2^{2 k}} \operatorname{sech}^2\left(\frac{z}{2^k}\right) = \frac{1}{z^2} - \operatorname{csch}^2(z)$$

## Products

### Finite products

01.24.24.0001.01

$$\prod_{k=1}^{n-1} \operatorname{sech}\left(\frac{i \pi k}{n} + z\right) = 2^{n-1} i \operatorname{csch}\left(n \left(z + \frac{\pi i}{2}\right)\right) \cosh(z) /; n \in \mathbb{N}^+$$

01.24.24.0002.01

$$\prod_{k=1}^{n-1} \operatorname{sech}\left(\frac{2 i \pi k}{n} + z\right) = \frac{(-2)^{n-1} \cosh(z)}{\cosh(n z) - \cos\left(\frac{n \pi}{2}\right)} /; n \in \mathbb{N}^+$$

### Infinite products

01.24.24.0003.01

$$\prod_{k=1}^{\infty} \operatorname{sech}\left(\frac{z}{2^k}\right) = z \operatorname{csch}(z)$$

## Representations through more general functions

### Through hypergeometric functions

01.24.26.0029.01

$$\operatorname{sech}(z) = \frac{4\pi}{4z^2 + \pi^2} \, {}_4F_3\left(1, \frac{3}{2}, \frac{1}{2} - \frac{i z}{\pi}, \frac{i z}{\pi} + \frac{1}{2}; \frac{1}{2}, \frac{3}{2} - \frac{i z}{\pi}, \frac{i z}{\pi} + \frac{3}{2}; -1\right)$$

Brychkov Yu.A. (2005)

01.24.26.0001.01

$$\operatorname{sech}(z) = \frac{1}{{}_0F_1\left(; \frac{1}{2}; \frac{z^2}{4}\right)}$$

### Through Meijer *G*

#### Classical cases for the direct function itself

01.24.26.0002.01

$$\operatorname{sech}(z) = \frac{1}{\sqrt{\pi} \, G_{0,2}^{1,0}\left(-\frac{z^2}{4} \,\middle|\, 0, \frac{1}{2}\right)}$$

#### Generalized cases for the direct function itself

01.24.26.0003.01

$$\operatorname{sech}(z) = \frac{1}{\sqrt{\pi} \, G_{0,2}^{1,0}\left(\frac{i z}{2}, \frac{1}{2} \,\middle|\, 0, \frac{1}{2}\right)}$$

### Through other functions

#### Involving Bessel functions

01.24.26.0004.01

$$\operatorname{sech}(z) = \sqrt{\frac{2}{\pi}} \, \frac{1}{\sqrt{i z} \, J_{-\frac{1}{2}}(i z)}$$

01.24.26.0005.01

$$\operatorname{sech}(z) = \sqrt{\frac{2}{\pi}} \, \frac{1}{\sqrt{z} \, I_{-\frac{1}{2}}(z)}$$

01.24.26.0006.01

$$\operatorname{sech}(z) = -\sqrt{\frac{2}{\pi}} \frac{1}{\sqrt{i z} \, Y_{\frac{1}{2}}(i z)}$$

## Involving Jacobi functions

01.24.26.0007.01

$$\operatorname{sech}(z) = \frac{1}{\operatorname{cd}(i z \mid 0)}$$

01.24.26.0008.01

$$\operatorname{sech}(z) = \frac{1}{\operatorname{cn}(i z \mid 0)}$$

01.24.26.0009.01

$$\operatorname{sech}(z) = \operatorname{cn}(z \mid 1)$$

01.24.26.0010.01

$$\operatorname{sech}(z) = i \operatorname{cs}\left(\frac{\pi i}{2} - z \,\middle|\, 1\right)$$

01.24.26.0011.01

$$\operatorname{sech}(z) = \operatorname{dc}(i z \mid 0)$$

01.24.26.0012.01

$$\operatorname{sech}(z) = \operatorname{dn}(z \mid 1)$$

01.24.26.0013.01

$$\operatorname{sech}(z) = \operatorname{ds}\left(\frac{\pi}{2} - i z \,\middle|\, 0\right)$$

01.24.26.0014.01

$$\operatorname{sech}(z) = i \operatorname{ds}\left(\frac{\pi i}{2} - z \,\middle|\, 1\right)$$

01.24.26.0015.01

$$\operatorname{sech}(z) = \operatorname{nc}(i z \mid 0)$$

01.24.26.0016.01

$$\operatorname{sech}(z) = \frac{1}{\operatorname{nc}(z \mid 1)}$$

01.24.26.0017.01

$$\operatorname{sech}(z) = \frac{1}{\operatorname{nd}(z \mid 1)}$$

01.24.26.0018.01

$$\operatorname{sech}(z) = \operatorname{ns}\left(\frac{\pi}{2} - i z \,\middle|\, 0\right)$$

01.24.26.0019.01

$$\operatorname{sech}(z) = \frac{i}{\operatorname{sc}\left(\frac{\pi i}{2} - z \,\middle|\, 1\right)}$$

01.24.26.0020.01

$$\operatorname{sech}(z) = \frac{i}{\operatorname{sd}\left(\frac{\pi i}{2} - z \,\middle|\, 1\right)}$$

01.24.26.0021.01

$$\operatorname{sech}(z) = \frac{1}{\operatorname{sd}\left(\frac{\pi}{2} - i z \,\middle|\, 0\right)}$$

01.24.26.0022.01

$$\operatorname{sech}(z) = \frac{1}{\operatorname{sn}\left(\frac{\pi}{2} - i z \,\middle|\, 0\right)}$$

### Involving Mathieu functions

01.24.26.0023.01

$$\operatorname{sech}\left(\sqrt{a}\ z\right) = \frac{\sqrt{a}}{\operatorname{Se}_z(a, 0, i z)}$$

01.24.26.0024.01

$$\operatorname{sech}\left(\sqrt{a}\ z\right) = \frac{1}{\operatorname{Ce}(a, 0, i z)}$$

### Involving some hypergeometric-type functions

01.24.26.0025.01

$$\operatorname{sech}(\pi z) = \frac{1}{\pi} \Gamma\left(\frac{1}{2} - i z\right) \Gamma\left(\frac{1}{2} + i z\right)$$

01.24.26.0026.01

$$\operatorname{sech}(z) = \frac{1}{1 - \sqrt{\frac{\pi i z}{2}}\ \boldsymbol{H}_{\frac{1}{2}}(i z)}$$

01.24.26.0027.01

$$\operatorname{sech}(z) = \frac{1}{1 + \sqrt{\frac{\pi z}{2}}\ \boldsymbol{L}_{\frac{1}{2}}(z)}$$

01.24.26.0028.01

$$\operatorname{sech}(n z) = \frac{1}{T_n(\cosh(z))}$$

## Representations through equivalent functions

### With inverse function

01.24.27.0001.01

$$\operatorname{sech}\left(\operatorname{sech}^{-1}(z)\right) = z$$

01.24.27.0003.02

$$\operatorname{sech}^{-1}(\operatorname{sech}(z)) = z \;/;\; (\operatorname{Re}(z) > 0 \land -\pi < \operatorname{Im}(z) \leq \pi) \lor (\operatorname{Re}(z) = 0 \land 0 \leq \operatorname{Im}(z) \leq \pi)$$

01.24.27.0064.01

$$\operatorname{sech}^{-1}(\operatorname{sech}(z)) == -z \;/;\; (\operatorname{Re}(z) < 0 \land -\pi \leq \operatorname{Im}(z) < \pi) \lor (\operatorname{Re}(z) = 0 \land -\pi \leq \operatorname{Im}(z) \leq 0)$$

01.24.27.0002.02

$$\operatorname{sech}^{-1}(\operatorname{sech}(z)) == \sqrt{z^2} \;/;\; -\pi < \operatorname{Im}(z) < \pi \lor \operatorname{Im}(z) == -\pi \land \operatorname{Re}(z) \leq 0 \lor \operatorname{Im}(z) == \pi \land \operatorname{Re}(z) \geq 0$$

01.24.27.0065.01

$$\operatorname{sech}^{-1}(\operatorname{sech}(z)) == \sqrt{z^2} \left(1 - \frac{2 \pi i k}{z}\right) /;$$
$$((2k-1)\pi < \operatorname{Im}(z) < (2k+1)\pi \bigvee \operatorname{Im}(z) == (2k-1)\pi \bigwedge \operatorname{Re}(z) < 0 \bigvee \operatorname{Im}(z) == (2k+1)\pi \bigwedge \operatorname{Re}(z) > 0) \bigwedge k \in \mathbb{Z} \bigvee$$
$$z == (2k-1)\pi i \bigwedge -k \in \mathbb{Z} \bigwedge -k \geq 0 \bigvee z == (2k+1)\pi i \bigwedge k \in \mathbb{Z} \bigwedge k \geq 0$$

01.24.27.0004.01

$$\operatorname{sech}^{-1}(\operatorname{sech}(z)) ==$$
$$\left(\sqrt{z^2} - \frac{\pi i}{2} e^{i\pi\left\lfloor \frac{1}{2} - \frac{\arg(z)}{\pi}\right\rfloor} \left(2\left\lfloor \frac{\operatorname{Im}(z)}{\pi}\right\rfloor - (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi}\right\rfloor} + 1\right)\right)(1 - \delta_{\operatorname{Re}(z)}) - \pi i\, \theta(\operatorname{Im}(z)) \left(1 + (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{2\pi} + \frac{1}{2}\right\rfloor + \left\lfloor -\frac{\operatorname{Im}(z)}{2\pi} - \frac{1}{2}\right\rfloor}\right) \delta_{\operatorname{Re}(z)} +$$
$$\left((-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi}\right\rfloor} \left(z - \pi i \left\lfloor \frac{\operatorname{Im}(z)}{\pi}\right\rfloor - \frac{\pi i}{2}\right) + \frac{i\pi}{2}\right) \delta_{\operatorname{Re}(z)} + \frac{\pi i}{2} \left(e^{i\pi\left\lfloor \frac{1}{2} - \frac{\arg(z)}{\pi}\right\rfloor} + 1\right) \left(1 + (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{2\pi} + \frac{1}{2}\right\rfloor + \left\lfloor -\frac{\operatorname{Im}(z)}{2\pi} - \frac{1}{2}\right\rfloor}\right) \theta(\operatorname{Re}(z))$$

01.24.27.0066.01

$$\operatorname{sech}^{-1}(\operatorname{sech}(z)) = \begin{cases} \frac{\pi i}{2} - (-1)^{\left\lfloor \frac{\pi - i z}{\pi}\right\rfloor} \left(z - \pi i \left\lfloor \frac{\pi - i z}{\pi}\right\rfloor + \frac{\pi i}{2}\right) & \operatorname{Re}(z) = 0 \\ \sqrt{z^2} \left(1 - \frac{2\pi i}{z} \left\lfloor \frac{\operatorname{Im}(z) - \pi}{2\pi}\right\rfloor\right) & \frac{\operatorname{Im}(z) + \pi}{2\pi} \in \mathbb{Z} \bigwedge \operatorname{Re}(z) > 0 \\ \sqrt{z^2} \left(1 - \frac{2\pi i}{z} \left\lfloor \frac{\operatorname{Im}(z) + \pi}{2\pi}\right\rfloor\right) & \text{True} \end{cases}$$

## With related functions

### Involving exp

01.24.27.0005.01

$$\operatorname{sech}(z) == \frac{2}{e^z + e^{-z}}$$

01.24.27.0006.01

$$\operatorname{sech}(z) == \frac{2 e^z}{e^{2z} + 1}$$

### Involving sin

01.24.27.0007.01

$$\operatorname{sech}(z) == \frac{1}{\sin\left(\frac{\pi}{2} - i z\right)}$$

01.24.27.0008.01

$$\operatorname{sech}(z) == \frac{1}{\sin\left(\frac{\pi}{2} + i z\right)}$$

01.24.27.0009.01

$$\operatorname{sech}(z) == \frac{1}{\sqrt{1 - \sin^2(i z)}} \;/;\; |\operatorname{Im}(z)| < \frac{\pi}{2}$$

01.24.27.0010.01

$$\operatorname{sech}(z) = \frac{1}{\sqrt{1-\sin^2(i\,z)}}\,(-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi}+\frac{1}{2}\right\rfloor}\left(1-\left(1+(-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi}+\frac{1}{2}\right\rfloor+\left\lfloor -\frac{\operatorname{Im}(z)}{\pi}-\frac{1}{2}\right\rfloor}\right)\theta(\operatorname{Re}(z))\right)$$

01.24.27.0011.01

$$\operatorname{sech}^2(z) = \frac{1}{1-\sin^2(i\,z)}$$

## Involving cos

01.24.27.0012.01

$$\operatorname{sech}(z) = \frac{1}{\cos(i\,z)}$$

01.24.27.0013.01

$$\operatorname{sech}(i\,z) = \frac{1}{\cos(z)}$$

## Involving tan

01.24.27.0014.01

$$\operatorname{sech}(z) = \frac{1+\tan^2\left(\frac{i\,z}{2}\right)}{1-\tan^2\left(\frac{i\,z}{2}\right)}$$

01.24.27.0015.01

$$\operatorname{sech}(z) = \sqrt{1+\tan^2(i\,z)}\ /;\ |\operatorname{Im}(z)| < \frac{\pi}{2}$$

01.24.27.0016.01

$$\operatorname{sech}(z) = \sqrt{1+\tan^2(i\,z)}\,(-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi}+\frac{1}{2}\right\rfloor}\left(1-\left(1+(-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi}+\frac{1}{2}\right\rfloor+\left\lfloor -\frac{\operatorname{Im}(z)}{\pi}-\frac{1}{2}\right\rfloor}\right)\theta(-\operatorname{Re}(z))\right)$$

01.24.27.0017.01

$$\operatorname{sech}^2(z) = 1+\tan^2(i\,z)$$

## Involving cot

01.24.27.0018.01

$$\operatorname{sech}(z) = \frac{\cot^2\left(\frac{i\,z}{2}\right)+1}{\cot^2\left(\frac{i\,z}{2}\right)-1}$$

01.24.27.0019.01

$$\operatorname{sech}(z) = i\,z\,\sqrt{-\frac{1}{z^2}}\,\frac{\sqrt{\cot^2(i\,z)+1}}{\cot(i\,z)}\ /;\ |\operatorname{Im}(z)| < \pi$$

01.24.27.0020.01

$$\operatorname{sech}(z) = -\frac{\sqrt{1+\cot^2(i\,z)}}{\cot(i\,z)}\ /;\ 0 < \operatorname{Im}(z) < \pi$$

01.24.27.0021.01

$$\operatorname{sech}(z) = \frac{\sqrt{\cot^2(i\,z)+1}}{\cot(i\,z)}\,(-1)^{\left\lfloor -\frac{\operatorname{Im}(z)}{\pi}\right\rfloor}\left(1-\left(1+(-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi}\right\rfloor+\left\lfloor -\frac{\operatorname{Im}(z)}{\pi}\right\rfloor}\right)\theta(\operatorname{Re}(z))\right)$$

01.24.27.0022.01

$$\operatorname{sech}^2(z) = \frac{\cot^2(i z) + 1}{\cot^2(i z)}$$

## Involving csc

01.24.27.0023.01

$$\operatorname{sech}(z) = \csc\left(\frac{\pi}{2} - i z\right)$$

01.24.27.0024.01

$$\operatorname{sech}(z) = \csc\left(i z + \frac{\pi}{2}\right)$$

01.24.27.0025.01

$$\operatorname{sech}(z) = i z \sqrt{-\frac{1}{z^2}} \frac{\csc(i z)}{\sqrt{\csc^2(i z) - 1}} \;/;\; |\operatorname{Im}(z)| < \frac{\pi}{2}$$

01.24.27.0026.01

$$\operatorname{sech}(z) = -\frac{\csc(i z)}{\sqrt{\csc^2(i z) - 1}} \;/;\; 0 < \operatorname{Im}(z) < \frac{\pi}{2}$$

01.24.27.0027.01

$$\operatorname{sech}(z) = \frac{\csc(i z)}{\sqrt{\csc^2(i z) - 1}} (-1)^{\left\lfloor -\frac{2 \operatorname{Im}(z)}{\pi} \right\rfloor} \left(1 - \left(1 + (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} - \frac{1}{2} \right\rfloor + \left\lfloor \frac{1}{2} - \frac{\operatorname{Im}(z)}{\pi} \right\rfloor}\right) \theta(-\operatorname{Re}(z))\right) \left(1 - \left(1 + (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} \right\rfloor + \left\lfloor -\frac{\operatorname{Im}(z)}{\pi} \right\rfloor}\right) \theta(\operatorname{Re}(z))\right)$$

01.24.27.0028.01

$$\operatorname{sech}^2(z) = \frac{\csc^2(i z)}{\csc^2(i z) - 1}$$

## Involving sec

01.24.27.0029.01

$$\operatorname{sech}(z) = \sec(i z)$$

01.24.27.0030.01

$$\operatorname{sech}(i z) = \sec(z)$$

## Involving sinh

01.24.27.0031.01

$$\operatorname{sech}(z) = \frac{1}{\sin\left(\frac{\pi}{2} - i z\right)}$$

01.24.27.0032.01

$$\operatorname{sech}(z) = \frac{1}{\sin\left(\frac{\pi}{2} + i z\right)}$$

01.24.27.0033.01

$$\operatorname{sech}(z) = \frac{1}{\sqrt{1 + \sinh^2(z)}} \;/;\; |\operatorname{Im}(z)| < \frac{\pi}{2}$$

01.24.27.0034.01

$$\operatorname{sech}(z) = \frac{1}{\sqrt{\sinh^2(z)+1}} (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} + \frac{1}{2} \right\rfloor} \left(1 - \left(1 + (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} + \frac{1}{2} \right\rfloor + \left\lfloor -\frac{\operatorname{Im}(z)}{\pi} - \frac{1}{2} \right\rfloor}\right) \theta(\operatorname{Re}(z))\right)$$

01.24.27.0035.01

$$\operatorname{sech}^2(z) = \frac{1}{1+\sinh^2(z)}$$

01.24.27.0036.01

$$\operatorname{sech}\left(\frac{\pi i}{2} + z\right) = -\frac{i}{\sinh(z)}$$

01.24.27.0037.01

$$\operatorname{sech}\left(\frac{\pi i}{2} - z\right) = \frac{i}{\sinh(z)}$$

## Involving cosh

01.24.27.0038.01

$$\operatorname{sech}(z) = \frac{1}{\cosh(z)}$$

## Involving tanh

01.24.27.0039.01

$$\operatorname{sech}(z) = \frac{1 - \tanh^2\left(\frac{z}{2}\right)}{\tanh^2\left(\frac{z}{2}\right) + 1}$$

01.24.27.0040.01

$$\operatorname{sech}(z) = \sqrt{1 - \tanh^2(z)} \ /;\ |\operatorname{Im}(z)| < \frac{\pi}{2}$$

01.24.27.0041.01

$$\operatorname{sech}(z) = \sqrt{1 - \tanh^2(z)} \ (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} + \frac{1}{2} \right\rfloor} \left(1 - \left(1 + (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} + \frac{1}{2} \right\rfloor + \left\lfloor -\frac{\operatorname{Im}(z)}{\pi} - \frac{1}{2} \right\rfloor}\right) \theta(-\operatorname{Re}(z))\right)$$

01.24.27.0042.01

$$\operatorname{sech}^2(z) = 1 - \tanh^2(z)$$

## Involving coth

01.24.27.0043.01

$$\operatorname{sech}(z) = \frac{\coth^2\left(\frac{z}{2}\right) - 1}{\coth^2\left(\frac{z}{2}\right) + 1}$$

01.24.27.0044.01

$$\operatorname{sech}(z) = z \sqrt{\frac{1}{z^2}} \ \frac{\sqrt{\coth^2(z) - 1}}{\coth(z)} \ /;\ |\operatorname{Im}(z)| < \frac{\pi}{2}$$

01.24.27.0045.01

$$\operatorname{sech}(z) = \frac{\sqrt{\coth^2(z) - 1}}{\coth(z)} \ /;\ \operatorname{Re}[z] > 0 \bigwedge |\operatorname{Im}(z)| < \frac{\pi}{2}$$

01.24.27.0046.01

$$\operatorname{sech}(z) = -z\sqrt{-\frac{1}{z^2}}\ \frac{\sqrt{1-\coth^2(z)}}{\coth(z)}\ /;\ |\operatorname{Im}(z)| < \pi$$

01.24.27.0047.01

$$\operatorname{sech}(z) = \frac{i\sqrt{1-\coth^2(z)}}{\coth(z)}\ (-1)^{\left\lfloor -\frac{\operatorname{Im}(z)}{\pi}\right\rfloor}\left(1-\left(1+(-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi}\right\rfloor+\left\lfloor -\frac{\operatorname{Im}(z)}{\pi}\right\rfloor}\right)\theta(\operatorname{Re}(z))\right)$$

01.24.27.0048.01

$$\operatorname{sech}^2(z) = \frac{\coth^2(z)-1}{\coth^2(z)}$$

## Involving csch

01.24.27.0049.01

$$\operatorname{sech}(z) = i\operatorname{csch}\left(\frac{\pi i}{2}-z\right)$$

01.24.27.0050.01

$$\operatorname{sech}(z) = i\operatorname{csch}\left(\frac{\pi i}{2}+z\right)$$

01.24.27.0051.01

$$\operatorname{sech}(z) = \frac{\operatorname{csch}(z)}{\sqrt{\operatorname{csch}^2(z)+1}}\ /;\ \operatorname{Re}(z) > 0$$

01.24.27.0052.01

$$\operatorname{sech}(z) = \frac{\sqrt{z^2}}{z}\ \frac{\operatorname{csch}(z)}{\sqrt{\operatorname{csch}^2(z)+1}}\ /;\ \operatorname{Re}(z) \neq 0$$

01.24.27.0053.01

$$\operatorname{sech}^2(z) = \frac{\operatorname{csch}^2(z)}{\operatorname{csch}^2(z)+1}$$

01.24.27.0054.01

$$\operatorname{sech}^2(z)+\operatorname{csch}^2(z) = \frac{\operatorname{csch}^2(z)\left(\operatorname{csch}^2(z)+2\right)}{\operatorname{csch}^2(z)+1}$$

01.24.27.0055.01

$$\operatorname{sech}^2(z)-\operatorname{csch}^2(z) = -\frac{4\operatorname{sech}^2(2z)}{1-\operatorname{sech}^2(2z)}$$

01.24.27.0056.01

$$\operatorname{sech}(z)+i\operatorname{csch}(z) = \frac{2\sqrt{2}\ \operatorname{csch}(2z)}{\operatorname{csch}\left(z+\frac{\pi i}{4}\right)}$$

01.24.27.0057.01

$$\operatorname{sech}(z)-i\operatorname{csch}(z) = \frac{2\sqrt{2}\ \operatorname{csch}(2z)}{\operatorname{csch}\left(z-\frac{\pi i}{4}\right)}$$

01.24.27.0058.01

$\operatorname{sech}(z) + \operatorname{csch}(z) == 2\, e^{z} \operatorname{csch}(2\, z)$

01.24.27.0059.01

$\operatorname{sech}(z) - \operatorname{csch}(z) == -2\, e^{-z} \operatorname{csch}(2\, z)$

01.24.27.0060.01

$a \operatorname{sech}(z) + b \operatorname{csch}(z) == 2\, b \sqrt{1 - \frac{a^2}{b^2}} \cosh\left(z + \tanh^{-1}\left(\frac{a}{b}\right)\right) \operatorname{csch}(2\, z)$

01.24.27.0061.01

$\operatorname{sech}\left(\frac{\pi i}{2} + z\right) == -i \operatorname{csch}(z)$

01.24.27.0062.01

$\operatorname{sech}\left(\frac{\pi i}{2} - z\right) == i \operatorname{csch}(z)$

### Involving trigonometric and hyperbolic functions

01.24.27.0063.01

$\operatorname{sech}^2(z) + \operatorname{csch}^2(z) == 4 \coth(2\, z) \operatorname{csch}(2\, z)$

## Inequalities

01.24.29.0001.01

$\operatorname{sech}(x) < x \operatorname{csch}(x) \;/;\; x > 0 \land x \in \mathbb{R}$

01.24.29.0002.01

$\operatorname{sech}(x) \leq 1 \;/;\; x \in \mathbb{R}$

01.24.29.0003.01

$\operatorname{sech}(x) \geq 0 \;/;\; x \in \mathbb{R}$

## Theorems

### Localized soliton of the Korteweg-de Vries equation

The function $u(x, t) == \operatorname{sech}^2\left(\frac{x - \frac{t}{3}}{2 \sqrt{3}}\right)$ is a localized soliton of the Korteweg-de Vries equation

$$\frac{\partial u(x, t)}{\partial t} + \frac{\partial u(x, t)}{\partial x} u(x, t) + \frac{\partial^3 u(x, t)}{\partial x^3} == 0.$$

## History

The function sech is encountered often in mathematics and the natural sciences.

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