Csch

Notations

Traditional name

Hyperbolic cosecant

Traditional notation

$\operatorname{csch}(z)$

Mathematica StandardForm notation

`Csch[z]`

Primary definition

01.23.02.0001.01

$$\operatorname{csch}(z) = \frac{1}{\sinh(z)} = \frac{2}{e^z - e^{-z}}$$

Specific values

Specialized values

01.23.03.0001.01

$$\operatorname{csch}(\pi\, i\, m) = \tilde{\infty} \;/;\; m \in \mathbb{Z}$$

01.23.03.0002.01

$$\operatorname{csch}\left(\pi\, i \left(\frac{1}{2} + m\right)\right) = (-1)^m \;/;\; m \in \mathbb{Z}$$

Values at fixed points

01.23.03.0003.01

$$\operatorname{csch}(0) = \tilde{\infty}$$

01.23.03.0004.01

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

01.23.03.0005.01

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

01.23.03.0006.01

$$\operatorname{csch}\left(\frac{\pi i}{10}\right) == -i\left(1+\sqrt{5}\right)$$

01.23.03.0007.01

$$\operatorname{csch}\left(\frac{\pi i}{10}\right) == \left(z;\, z^4+12\, z^2+16\right)_3^{-1}$$

01.23.03.0008.01

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

01.23.03.0009.01

$$\operatorname{csch}\left(\frac{\pi i}{9}\right) == \left(z;\, 3\, z^6+36\, z^4+96\, z^2+64\right)_5^{-1}$$

01.23.03.0010.01

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

01.23.03.0011.01

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

01.23.03.0012.01

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

01.23.03.0013.01

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

01.23.03.0014.01

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

01.23.03.0015.01

$$\operatorname{csch}\left(\frac{\pi i}{7}\right) == \left(z;\, 7\, z^6+56\, z^4+112\, z^2+64\right)_1^{-1}$$

01.23.03.0016.01

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

01.23.03.0017.01

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

01.23.03.0018.01

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

01.23.03.0019.01

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

01.23.03.0020.01

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

01.23.03.0021.01

$$\operatorname{csch}\left(\frac{2 \pi i}{9}\right) == \left(z; 3 z^6+36 z^4+96 z^2+64\right)_1^{-1}$$

01.23.03.0022.01

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

01.23.03.0023.01

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

01.23.03.0024.01

$$\operatorname{csch}\left(\frac{2 \pi i}{7}\right) ==$$

$$-\left(12 i\, 2^{2/3} \sqrt[3]{7-21 i \sqrt{3}}\right) \Bigg/ \left(2\, 2^{2/3}\, 7^{5/6} \sqrt[3]{1-3 i \sqrt{3}}+4 \sqrt{7} \sqrt[3]{7-\frac{i \sqrt{7}}{2}-\frac{3 \sqrt{21}}{2}}-2 \sqrt{7} \sqrt[3]{7+\frac{i \sqrt{7}}{2}+\frac{3 \sqrt{21}}{2}}-\right.$$

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

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

01.23.03.0025.01

$$\operatorname{csch}\left(\frac{2 \pi i}{7}\right) == \left(z; 7 z^6+56 z^4+112 z^2+64\right)_5^{-1}$$

01.23.03.0026.01

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

01.23.03.0027.01

$$\operatorname{csch}\left(\frac{3\pi i}{10}\right) = -i\left(\sqrt{5}-1\right)$$

01.23.03.0028.01

$$\operatorname{csch}\left(\frac{3\pi i}{10}\right) = \left(z;\, z^4+12z^2+16\right)_1^{-1}$$

01.23.03.0029.01

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

01.23.03.0030.01

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

01.23.03.0031.01

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

01.23.03.0032.01

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

01.23.03.0033.01

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

01.23.03.0034.01

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

01.23.03.0035.01

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

01.23.03.0036.01

$$\operatorname{csch}\left(\frac{5\pi i}{12}\right) = \left(z;\, z^4+16z^2+16\right)_1^{-1}$$

01.23.03.0037.01

$$\operatorname{csch}\left(\frac{3\pi i}{7}\right) = -\left(6\, 2^{2/3}\sqrt[3]{7-21i\sqrt{3}}\right) \Bigg/ \left(-i\, 2^{2/3}\, 7^{5/6}\sqrt[3]{1-3i\sqrt{3}} + \sqrt{7}\left(i+\sqrt{3}\right)\sqrt[3]{7-\frac{i\sqrt{7}}{2}-\frac{3\sqrt{21}}{2}} - \frac{1}{2}i\left(4\sqrt{7}\sqrt[3]{7+\frac{i\sqrt{7}}{2}+\frac{3\sqrt{21}}{2}} + \sqrt[3]{14-42i\sqrt{3}}\left(-2i\sqrt[3]{14-i\sqrt{7}-3\sqrt{21}} + \left(-i+\sqrt{3}\right)\sqrt[3]{14+i\sqrt{7}+3\sqrt{21}}\right)\right)\right)$$

01.23.03.0038.01

$$\operatorname{csch}\left(\frac{3\pi i}{7}\right) == \left(z;\, 7z^6 + 56z^4 + 112z^2 + 64\right)_3^{-1}$$

01.23.03.0039.01

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

01.23.03.0040.01

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

01.23.03.0041.01

$$\operatorname{csch}\left(\frac{4\pi i}{9}\right) == \left(z;\, 3z^6 + 36z^4 + 96z^2 + 64\right)_3^{-1}$$

01.23.03.0042.01

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

01.23.03.0043.01

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

01.23.03.0044.01

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

01.23.03.0045.01

$$\operatorname{csch}\left(\frac{5\pi i}{9}\right) == \left(z;\, 3z^6 + 36z^4 + 96z^2 + 64\right)_3^{-1}$$

01.23.03.0046.01

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

01.23.03.0047.01

$$\operatorname{csch}\left(\frac{4\pi i}{7}\right) == -\left(6\, 2^{2/3}\sqrt[3]{7 - 21i\sqrt{3}}\right) \Big/ \left(-i\, 2^{2/3}\, 7^{5/6}\sqrt[3]{1 - 3i\sqrt{3}} + \sqrt{7}\left(i + \sqrt{3}\right)\sqrt[3]{7 - \frac{i\sqrt{7}}{2} - \frac{3\sqrt{21}}{2}} - \frac{1}{2}i\left(4\sqrt{7}\sqrt[3]{7 + \frac{i\sqrt{7}}{2} + \frac{3\sqrt{21}}{2}} + \sqrt[3]{14 - 42i\sqrt{3}}\left(-2i\sqrt[3]{14 - i\sqrt{7} - 3\sqrt{21}} + \left(-i + \sqrt{3}\right)\sqrt[3]{14 + i\sqrt{7} + 3\sqrt{21}}\right)\right)\right)$$

01.23.03.0048.01

$$\operatorname{csch}\left(\frac{4\pi i}{7}\right) == \left(z;\, 7z^6 + 56z^4 + 112z^2 + 64\right)_3^{-1}$$

01.23.03.0049.01

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

01.23.03.0050.01

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

01.23.03.0051.01

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

01.23.03.0052.01

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

01.23.03.0053.01

$$\operatorname{csch}\left(\frac{3\pi i}{5}\right) = \left(z;\, 5z^4+20z^2+16\right)_1^{-1}$$

01.23.03.0054.01

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

01.23.03.0055.01

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

01.23.03.0056.01

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

01.23.03.0057.01

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

01.23.03.0058.01

$$\operatorname{csch}\left(\frac{7\pi i}{10}\right) = -i\left(\sqrt{5}-1\right)$$

01.23.03.0059.01

$$\operatorname{csch}\left(\frac{7\pi i}{10}\right) = \left(z;\, z^4+12z^2+16\right)_1^{-1}$$

01.23.03.0060.01

$$\operatorname{csch}\left(\frac{5\pi i}{7}\right) = -\left(12\, i\, 2^{2/3} \sqrt[3]{7-21\, i\sqrt{3}}\right) \Big/ \left(2\, 2^{2/3}\, 7^{5/6} \sqrt[3]{1-3\, i\sqrt{3}} + 4\sqrt{7}\sqrt[3]{7-\frac{i\sqrt{7}}{2}-\frac{3\sqrt{21}}{2}} - 2\sqrt{7}\sqrt[3]{7+\frac{i\sqrt{7}}{2}+\frac{3\sqrt{21}}{2}} - 2\, i\sqrt{21}\sqrt[3]{7+\frac{i\sqrt{7}}{2}+\frac{3\sqrt{21}}{2}} + i\left(14-i\sqrt{7}-3\sqrt{21}\right)^{2/3}\sqrt[3]{14+i\sqrt{7}+3\sqrt{21}} + \sqrt{3}\left(14-i\sqrt{7}-3\sqrt{21}\right)^{2/3}\sqrt[3]{14+i\sqrt{7}+3\sqrt{21}} + 2\, i\sqrt[3]{14-i\sqrt{7}-3\sqrt{21}}\left(14+i\sqrt{7}+3\sqrt{21}\right)^{2/3}\right)$$

01.23.03.0061.01

$$\operatorname{csch}\left(\frac{5\pi i}{7}\right) = \left(z;\, 7z^6+56z^4+112z^2+64\right)_5^{-1}$$

01.23.03.0062.01

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

01.23.03.0063.01

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

01.23.03.0064.01

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

01.23.03.0065.01

$$\operatorname{csch}\left(\frac{7\pi i}{9}\right) = \left(z;\, 3z^6+36z^4+96z^2+64\right)_1^{-1}$$

01.23.03.0066.01

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

01.23.03.0067.01

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

01.23.03.0068.01

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

01.23.03.0069.01

$$\operatorname{csch}\left(\frac{5\pi i}{6}\right) = -2\, i$$

01.23.03.0070.01

$$\operatorname{csch}\left(\frac{6\pi i}{7}\right) = 24 \Big/ \left(-4\, i\sqrt{7} + \frac{2\sqrt{7}\left(i+\sqrt{3}\right)}{\sqrt[3]{7-\frac{i\sqrt{7}}{2}-\frac{3\sqrt{21}}{2}}} + \left(2+2\, i\sqrt{3}\right)\sqrt[3]{7-\frac{i\sqrt{7}}{2}-\frac{3\sqrt{21}}{2}} - \frac{2\sqrt{7}\left(-i+\sqrt{3}\right)}{\sqrt[3]{7+\frac{i\sqrt{7}}{2}+\frac{3\sqrt{21}}{2}}} + 2\, i\left(i+\sqrt{3}\right)\sqrt[3]{7+\frac{i\sqrt{7}}{2}+\frac{3\sqrt{21}}{2}}\right)$$

01.23.03.0071.01

$$\operatorname{csch}\left(\frac{6\pi i}{7}\right) = \left(z;\, 7z^6+56z^4+112z^2+64\right)_1^{-1}$$

01.23.03.0072.01

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

01.23.03.0073.01

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

01.23.03.0074.01

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

01.23.03.0075.01

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

01.23.03.0076.01

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

01.23.03.0077.01

$$\operatorname{csch}\left(\frac{8\pi i}{9}\right) = \left(z;\, 3z^6+36z^4+96z^2+64\right)_5^{-1}$$

01.23.03.0078.01

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

01.23.03.0079.01

$$\operatorname{csch}\left(\frac{9\pi i}{10}\right) = -i\left(1+\sqrt{5}\right)$$

01.23.03.0080.01

$$\operatorname{csch}\left(\frac{9\pi i}{10}\right) = \left(z;\, z^4+12z^2+16\right)_3^{-1}$$

01.23.03.0081.01

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

01.23.03.0082.01

$$\operatorname{csch}\left(\frac{11\pi i}{12}\right) == \left(z;\, z^4 + 16 z^2 + 16\right)_3^{-1}$$

01.23.03.0083.01

$$\operatorname{csch}(\pi i) == \tilde{\infty}$$

01.23.03.0084.01

$$\operatorname{csch}\left(\frac{13\pi i}{12}\right) == 2 i \sqrt{2 + \sqrt{3}}$$

01.23.03.0085.01

$$\operatorname{csch}\left(\frac{13\pi i}{12}\right) == \left(z;\, z^4 + 16 z^2 + 16\right)_4^{-1}$$

01.23.03.0086.01

$$\operatorname{csch}\left(\frac{11\pi i}{10}\right) == i\left(1 + \sqrt{5}\right)$$

01.23.03.0087.01

$$\operatorname{csch}\left(\frac{11\pi i}{10}\right) == \left(z;\, z^4 + 12 z^2 + 16\right)_4^{-1}$$

01.23.03.0088.01

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

01.23.03.0089.01

$$\operatorname{csch}\left(\frac{10\pi i}{9}\right) == \left(z;\, 3 z^6 + 36 z^4 + 96 z^2 + 64\right)_6^{-1}$$

01.23.03.0090.01

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

01.23.03.0091.01

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

01.23.03.0092.01

$$\operatorname{csch}\left(\frac{9\pi i}{8}\right) == \left(z;\, z^4 + 8 z^2 + 8\right)_4^{-1}$$

01.23.03.0093.01

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

01.23.03.0094.01

$$\operatorname{csch}\left(\frac{8\pi i}{7}\right) = 24 \Bigg/ \left(4 i \sqrt{7} - \frac{2\sqrt{7}\left(i+\sqrt{3}\right)}{\sqrt[3]{7 - \frac{i\sqrt{7}}{2} - \frac{3\sqrt{21}}{2}}} - \left(2 + 2 i \sqrt{3}\right)\sqrt[3]{7 - \frac{i\sqrt{7}}{2} - \frac{3\sqrt{21}}{2}} + \frac{2\sqrt{7}\left(-i+\sqrt{3}\right)}{\sqrt[3]{7 + \frac{i\sqrt{7}}{2} + \frac{3\sqrt{21}}{2}}} + 2\left(1 - i\sqrt{3}\right)\sqrt[3]{7 + \frac{i\sqrt{7}}{2} + \frac{3\sqrt{21}}{2}}\right)$$

01.23.03.0095.01

$$\operatorname{csch}\left(\frac{8\pi i}{7}\right) = \left(z;\, 7z^6 + 56z^4 + 112z^2 + 64\right)_2^{-1}$$

01.23.03.0096.01

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

01.23.03.0097.01

$$\operatorname{csch}\left(\frac{7\pi i}{6}\right) = 2i$$

01.23.03.0098.01

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

01.23.03.0099.01

$$\operatorname{csch}\left(\frac{6\pi i}{5}\right) = \left(z;\, 5z^4 + 20z^2 + 16\right)_4^{-1}$$

01.23.03.0100.01

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

01.23.03.0101.01

$$\operatorname{csch}\left(\frac{11\pi i}{9}\right) = \left(z;\, 3z^6 + 36z^4 + 96z^2 + 64\right)_2^{-1}$$

01.23.03.0102.01

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

01.23.03.0103.01

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

01.23.03.0104.01

$$\operatorname{csch}\left(\frac{9\pi i}{7}\right) = \left(12\, i\, 2^{2/3} \sqrt[3]{7 - 21\, i \sqrt{3}}\right) \Bigg/ \left(2\, 2^{2/3}\, 7^{5/6} \sqrt[3]{1 - 3\, i \sqrt{3}} + 4\sqrt{7} \sqrt[3]{7 - \frac{i\sqrt{7}}{2} - \frac{3\sqrt{21}}{2}} - 2\sqrt{7} \sqrt[3]{7 + \frac{i\sqrt{7}}{2} + \frac{3\sqrt{21}}{2}} - 2\, i \sqrt{21} \sqrt[3]{7 + \frac{i\sqrt{7}}{2} + \frac{3\sqrt{21}}{2}} + i\left(14 - i\sqrt{7} - 3\sqrt{21}\right)^{2/3} \sqrt[3]{14 + i\sqrt{7} + 3\sqrt{21}} + \sqrt{3}\left(14 - i\sqrt{7} - 3\sqrt{21}\right)^{2/3} \sqrt[3]{14 + i\sqrt{7} + 3\sqrt{21}} + 2\, i \sqrt[3]{14 - i\sqrt{7} - 3\sqrt{21}} \left(14 + i\sqrt{7} + 3\sqrt{21}\right)^{2/3}\right)$$

01.23.03.0105.01

$$\operatorname{csch}\left(\frac{9\pi i}{7}\right) = \left(z;\, 7 z^6 + 56 z^4 + 112 z^2 + 64\right)_6^{-1}$$

01.23.03.0106.01

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

01.23.03.0107.01

$$\operatorname{csch}\left(\frac{13\pi i}{10}\right) = i\left(\sqrt{5} - 1\right)$$

01.23.03.0108.01

$$\operatorname{csch}\left(\frac{13\pi i}{10}\right) = \left(z;\, z^4 + 12 z^2 + 16\right)_2^{-1}$$

01.23.03.0109.01

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

01.23.03.0110.01

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

01.23.03.0111.01

$$\operatorname{csch}\left(\frac{11\pi i}{8}\right) = \left(z;\, z^4 + 8 z^2 + 8\right)_2^{-1}$$

01.23.03.0112.01

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

01.23.03.0113.01

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

01.23.03.0114.01

$$\operatorname{csch}\left(\frac{7\pi i}{5}\right) == \left(z;\, 5z^4 + 20z^2 + 16\right)_2^{-1}$$

01.23.03.0115.01

$$\operatorname{csch}\left(\frac{17\pi i}{12}\right) == i\left(\sqrt{6} - \sqrt{2}\right)$$

01.23.03.0116.01

$$\operatorname{csch}\left(\frac{17\pi i}{12}\right) == \left(z;\, z^4 + 16z^2 + 16\right)_2^{-1}$$

01.23.03.0117.01

$$\operatorname{csch}\left(\frac{10\pi i}{7}\right) == \left(6\, 2^{2/3} \sqrt[3]{7 - 21 i \sqrt{3}}\right) \Big/ \left(-i\, 2^{2/3}\, 7^{5/6} \sqrt[3]{1 - 3 i \sqrt{3}} + \sqrt{7}\left(i + \sqrt{3}\right) \sqrt[3]{7 - \frac{i\sqrt{7}}{2} - \frac{3\sqrt{21}}{2}} - \frac{1}{2} i \left(4\sqrt{7} \sqrt[3]{7 + \frac{i\sqrt{7}}{2} + \frac{3\sqrt{21}}{2}} + \sqrt[3]{14 - 42 i \sqrt{3}} \left(-2 i \sqrt[3]{14 - i\sqrt{7} - 3\sqrt{21}} + \left(-i + \sqrt{3}\right) \sqrt[3]{14 + i\sqrt{7} + 3\sqrt{21}}\right)\right)\right)$$

01.23.03.0118.01

$$\operatorname{csch}\left(\frac{10\pi i}{7}\right) == \left(z;\, 7z^6 + 56z^4 + 112z^2 + 64\right)_4^{-1}$$

01.23.03.0119.01

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

01.23.03.0120.01

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

01.23.03.0121.01

$$\operatorname{csch}\left(\frac{13\pi i}{9}\right) == \left(z;\, 3z^6 + 36z^4 + 96z^2 + 64\right)_4^{-1}$$

01.23.03.0122.01

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

01.23.03.0123.01

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

01.23.03.0124.01

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

01.23.03.0125.01

$$\operatorname{csch}\left(\frac{14\pi i}{9}\right) = \left(z;\, 3z^6 + 36z^4 + 96z^2 + 64\right)_4^{-1}$$

01.23.03.0126.01

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

01.23.03.0127.01

$$\operatorname{csch}\left(\frac{11\pi i}{7}\right) = \left(6\, 2^{2/3} \sqrt[3]{7 - 21 i \sqrt{3}}\right) \Big/ \left(-i\, 2^{2/3}\, 7^{5/6} \sqrt[3]{1 - 3 i \sqrt{3}} + \sqrt{7}\left(i + \sqrt{3}\right) \sqrt[3]{7 - \frac{i\sqrt{7}}{2} - \frac{3\sqrt{21}}{2}} - \frac{1}{2} i \left(4\sqrt{7} \sqrt[3]{7 + \frac{i\sqrt{7}}{2} + \frac{3\sqrt{21}}{2}} + \sqrt[3]{14 - 42 i \sqrt{3}} \left(-2 i \sqrt[3]{14 - i\sqrt{7} - 3\sqrt{21}} + \left(-i + \sqrt{3}\right) \sqrt[3]{14 + i\sqrt{7} + 3\sqrt{21}}\right)\right)\right)$$

01.23.03.0128.01

$$\operatorname{csch}\left(\frac{11\pi i}{7}\right) = \left(z;\, 7z^6 + 56z^4 + 112z^2 + 64\right)_4^{-1}$$

01.23.03.0129.01

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

01.23.03.0130.01

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

01.23.03.0131.01

$$\operatorname{csch}\left(\frac{19\pi i}{12}\right) = \left(z;\, z^4 + 16z^2 + 16\right)_2^{-1}$$

01.23.03.0132.01

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

01.23.03.0133.01

$$\operatorname{csch}\left(\frac{8\pi i}{5}\right) = \left(z;\, 5z^4 + 20z^2 + 16\right)_2^{-1}$$

01.23.03.0134.01

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

01.23.03.0135.01

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

01.23.03.0136.01

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

01.23.03.0137.01

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

01.23.03.0138.01

$$\operatorname{csch}\left(\frac{17\pi i}{10}\right) = i\left(\sqrt{5}-1\right)$$

01.23.03.0139.01

$$\operatorname{csch}\left(\frac{17\pi i}{10}\right) = \left(z;\, z^4+12z^2+16\right)_2^{-1}$$

01.23.03.0140.01

$$\operatorname{csch}\left(\frac{12\pi i}{7}\right) = \left(12\, i\, 2^{2/3}\sqrt[3]{7-21 i\sqrt{3}}\right)\Big/\left(2\, 2^{2/3}\, 7^{5/6}\sqrt[3]{1-3 i\sqrt{3}} + 4\sqrt{7}\sqrt[3]{7-\frac{i\sqrt{7}}{2}-\frac{3\sqrt{21}}{2}} - 2\sqrt{7}\sqrt[3]{7+\frac{i\sqrt{7}}{2}+\frac{3\sqrt{21}}{2}} - 2 i\sqrt{21}\sqrt[3]{7+\frac{i\sqrt{7}}{2}+\frac{3\sqrt{21}}{2}} + i\left(14-i\sqrt{7}-3\sqrt{21}\right)^{2/3}\sqrt[3]{14+i\sqrt{7}+3\sqrt{21}} + \sqrt{3}\left(14-i\sqrt{7}-3\sqrt{21}\right)^{2/3}\sqrt[3]{14+i\sqrt{7}+3\sqrt{21}} + 2 i\sqrt[3]{14-i\sqrt{7}-3\sqrt{21}}\left(14+i\sqrt{7}+3\sqrt{21}\right)^{2/3}\right)$$

01.23.03.0141.01

$$\operatorname{csch}\left(\frac{12\pi i}{7}\right) = \left(z;\, 7z^6+56z^4+112z^2+64\right)_6^{-1}$$

01.23.03.0142.01

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

01.23.03.0143.01

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

01.23.03.0144.01

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

01.23.03.0145.01

$$\operatorname{csch}\left(\frac{16\pi i}{9}\right) = \left(z;\, 3z^6+36z^4+96z^2+64\right)_2^{-1}$$

01.23.03.0146.01

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

01.23.03.0147.01

$$\operatorname{csch}\left(\frac{9\pi i}{5}\right) == i\sqrt{2+\frac{2}{\sqrt{5}}}$$

01.23.03.0148.01

$$\operatorname{csch}\left(\frac{9\pi i}{5}\right) == \left(z;\, 5z^4+20z^2+16\right)_4^{-1}$$

01.23.03.0149.01

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

01.23.03.0150.01

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

01.23.03.0151.01

$$\operatorname{csch}\left(\frac{13\pi i}{7}\right) == \left(z;\, 7z^6+56z^4+112z^2+64\right)_2^{-1}$$

01.23.03.0152.01

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

01.23.03.0153.01

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

01.23.03.0154.01

$$\operatorname{csch}\left(\frac{15\pi i}{8}\right) == \left(z;\, z^4+8z^2+8\right)_4^{-1}$$

01.23.03.0155.01

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

01.23.03.0156.01

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

01.23.03.0157.01

$$\operatorname{csch}\left(\frac{17\pi i}{9}\right) = \left(z;\, 3z^6 + 36z^4 + 96z^2 + 64\right)_6^{-1}$$

01.23.03.0158.01

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

01.23.03.0159.01

$$\operatorname{csch}\left(\frac{19\pi i}{10}\right) = i\left(1 + \sqrt{5}\right)$$

01.23.03.0160.01

$$\operatorname{csch}\left(\frac{19\pi i}{10}\right) = \left(z;\, z^4 + 12z^2 + 16\right)_4^{-1}$$

01.23.03.0161.01

$$\operatorname{csch}\left(\frac{23\pi i}{12}\right) = 2i\sqrt{2 + \sqrt{3}}$$

01.23.03.0162.01

$$\operatorname{csch}\left(\frac{23\pi i}{12}\right) = \left(z;\, z^4 + 16z^2 + 16\right)_4^{-1}$$

01.23.03.0163.01

$$\operatorname{csch}(2\pi i) = \tilde{\infty}$$

01.23.03.0164.01

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

01.23.03.0165.01

$$\operatorname{csch}\left(\frac{\pi i}{30}\right) = -i\left(2 + \sqrt{5} + \sqrt{15 + 6\sqrt{5}}\right)$$

$\operatorname{csch}\left(\frac{n i \pi}{m}\right)$ 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

01.23.03.0166.01

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

01.23.03.0167.01

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

01.23.03.0168.01

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

General characteristics

Domain and analyticity

csch(z) is an analytical function of z which is defined over the whole complex z-plane.

01.23.04.0001.01

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

Symmetries and periodicities

Parity

csch(z) is an odd function.

01.23.04.0002.01

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

Mirror symmetry

01.23.04.0003.01

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

Periodicity

csch(z) is a periodic function with period $2 \pi i$.

01.23.04.0010.01

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

01.23.04.0004.01

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

01.23.04.0005.01

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

Poles and essential singularities

The function csch(z) has an infinite set of singular points:

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

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

01.23.04.0006.01

$\mathcal{Sing}_z(\operatorname{csch}(z)) == \{\{\{\pi i k, 1\} /; k \in \mathbb{Z}\}, \{\tilde{\infty}, \infty\}\}$

01.23.04.0007.01

$\operatorname{res}_z(\operatorname{csch}(z))(\pi i k) == (-1)^k /; k \in \mathbb{Z}$

Branch points

The function csch(z) does not have branch points.

01.23.04.0008.01

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

Branch cuts

The function csch(z) does not have branch cuts.

01.23.04.0009.01

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

Series representations

Generalized power series

Expansions at $z == z_0$

For the function itself

01.23.06.0023.01

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

01.23.06.0024.01

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

01.23.06.0025.01

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

01.23.06.0026.01

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

Expansions at $z == 0$

For the function itself

01.23.06.0001.02

$$\operatorname{csch}(z) \propto \frac{1}{z} - \frac{z}{6} + \frac{7 z^3}{360} - \ldots \;/;\; (z \to 0)$$

01.23.06.0027.01

$$\operatorname{csch}(z) \propto \frac{1}{z} - \frac{z}{6} + \frac{7 z^3}{360} - O\left(z^5\right)$$

01.23.06.0002.01

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

01.23.06.0003.02

$$\operatorname{csch}(z) \propto \frac{1}{z} - \frac{z}{6} + O(z^3)$$

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

For the function itself

01.23.06.0004.02

$$\operatorname{csch}(z) \propto -i + \frac{i}{2}\left(z - \frac{i\pi}{2}\right)^2 - \frac{5i}{24}\left(z - \frac{i\pi}{2}\right)^4 + \ldots \;/;\; \left(z \to \frac{\pi i}{2}\right)$$

01.23.06.0028.01

$$\operatorname{csch}(z) \propto -i + \frac{i}{2}\left(z - \frac{i\pi}{2}\right)^2 - \frac{5i}{24}\left(z - \frac{i\pi}{2}\right)^4 + O\left(\left(z - \frac{i\pi}{2}\right)^6\right)$$

01.23.06.0005.01

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

01.23.06.0006.02

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

q-series

01.23.06.0007.01

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

Dirichlet series

01.23.06.0008.01

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

01.23.06.0009.01

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

Asymptotic series expansions

01.23.06.0010.01

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

01.23.06.0011.01

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

01.23.06.0012.01

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

01.23.06.0013.01

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

01.23.06.0014.01

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

01.23.06.0015.01

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

01.23.06.0016.01

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

01.23.06.0029.01

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

Other series representations

01.23.06.0017.01

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

01.23.06.0018.01

$$\operatorname{csch}(z) == \frac{1}{z} - \frac{i\, z}{\pi} \sum_{\substack{k=-\infty \\ k \neq 0}}^{\infty} \frac{(-1)^k}{k\, (z - i\, \pi\, k)} /; \frac{i\, z}{\pi} \notin \mathbb{Z}$$

01.23.06.0019.01

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

01.23.06.0020.01

$$\log(z \operatorname{csch}(z)) == \sum_{k=1}^{\infty} \frac{\zeta(2\, k)}{k} \left(\frac{i\, z}{\pi}\right)^{2k} /; |z| < \pi$$

01.23.06.0021.01

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

01.23.06.0022.01

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

Integral representations

On the real axis

Of the direct function

01.23.07.0001.01

$$\operatorname{csch}(z) == \frac{i}{\pi} \int_0^\infty \frac{1}{t^2 + t} t^{\frac{i z}{\pi}} \, dt \,/;\, -\pi < \operatorname{Im}(z) < 0$$

Product representations

01.23.08.0001.01

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

01.23.08.0002.01

$$\operatorname{csch}(z) == \frac{1}{z} \prod_{k=1}^{\infty} \operatorname{sech}\left(\frac{z}{2^k}\right) /;\, |z| < 1$$

Limit representations

01.23.09.0001.01

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

Differential equations

Ordinary nonlinear differential equations

01.23.13.0001.01

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

01.23.13.0002.01

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

Transformations

Transformations and argument simplifications

Argument involving basic arithmetic operations

01.23.16.0001.01

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

01.23.16.0002.01

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

01.23.16.0003.01

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

Argument involving inverse trigonometric and hyperbolic functions

Involving $\sin^{-1}$

01.23.16.0056.01

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

01.23.16.0004.01

$$\operatorname{csch}\left(i \sin^{-1}(z)\right) = -\frac{i}{z}$$

01.23.16.0016.01

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

01.23.16.0057.01

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

Involving $\cos^{-1}$

01.23.16.0058.01

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

01.23.16.0005.01

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

01.23.16.0017.01

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

01.23.16.0059.01

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

Involving $\tan^{-1}$

01.23.16.0060.01

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

01.23.16.0061.01

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

01.23.16.0006.01

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

01.23.16.0062.01

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

01.23.16.0018.01

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

01.23.16.0063.01

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

01.23.16.0064.01

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

01.23.16.0065.01

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

Involving $\cot^{-1}$

01.23.16.0066.01

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

01.23.16.0007.01

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

01.23.16.0019.01

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

01.23.16.0067.01

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

Involving $\csc^{-1}$

01.23.16.0068.01

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

01.23.16.0008.01

$$\operatorname{csch}\left(i \csc^{-1}(z)\right) = -i\, z$$

01.23.16.0020.01

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

01.23.16.0069.01

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

Involving $\sec^{-1}$

01.23.16.0070.01

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

01.23.16.0009.01

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

01.23.16.0021.01

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

01.23.16.0071.01

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

Involving $\sinh^{-1}$

01.23.16.0010.01

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

01.23.16.0022.01

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

01.23.16.0072.01

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

01.23.16.0073.01

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

Involving $\cosh^{-1}$

01.23.16.0011.01

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

01.23.16.0023.01

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

01.23.16.0074.01

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

01.23.16.0075.01

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

Involving $\tanh^{-1}$

01.23.16.0012.01

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

01.23.16.0024.01

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

01.23.16.0076.01

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

01.23.16.0077.01

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

Involving $\coth^{-1}$

01.23.16.0013.01

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

01.23.16.0025.01

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

01.23.16.0078.01

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

01.23.16.0079.01

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

Involving csch^{-1}

01.23.16.0014.01

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

01.23.16.0026.01

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

01.23.16.0080.01

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

01.23.16.0081.01

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

Involving sech^{-1}

01.23.16.0015.01

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

01.23.16.0027.01

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

01.23.16.0082.01

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

01.23.16.0083.01

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

Addition formulas

01.23.16.0028.01

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

01.23.16.0029.01

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

01.23.16.0030.01

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

01.23.16.0031.01

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

Half-angle formulas

01.23.16.0032.01

$$\operatorname{csch}\left(\frac{z}{2}\right) = \frac{\sqrt{2}}{\sqrt{\cosh(z)-1}} \;/;\; 0<\operatorname{Re}(z)\land|\operatorname{Im}(z)|<\pi$$

01.23.16.0033.01

$$\operatorname{csch}\left(\frac{z}{2}\right) = \frac{\sqrt{2\,z^2}}{z\sqrt{\cosh(z)-1}} \;/;\; |\operatorname{Im}(z)|<\pi$$

01.23.16.0034.01

$$\operatorname{csch}\left(\frac{z}{2}\right) = \frac{\sqrt{z^2}\,(-1)^{\left\lfloor\frac{\operatorname{Im}(z)}{2\pi}+\frac{1}{2}\right\rfloor}}{z}\,\frac{\sqrt{2}}{\sqrt{\cosh(z)-1}}\left(1-\left(1+(-1)^{\left\lfloor\frac{\operatorname{Im}(z)}{2\pi}+\frac{1}{2}\right\rfloor+\left\lfloor-\frac{\operatorname{Im}(z)}{2\pi}-\frac{1}{2}\right\rfloor}\right)\theta(\operatorname{Re}(z))\right) /;\; \frac{z-\pi\,i}{2\,\pi\,i}\notin\mathbb{Z}$$

Multiple arguments

Argument involving numeric multiples of variable

01.23.16.0035.01

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

01.23.16.0084.01

$$\operatorname{csch}(3z) = \frac{\operatorname{csch}^3(z)}{4 + 3\operatorname{csch}^2(z)}$$

Argument involving symbolic multiples of variable

01.23.16.0036.01

$$\operatorname{csch}(nz) = i^{n-1}\, 2^{1-n} \prod_{k=0}^{n-1} \operatorname{csch}\left(z + \frac{i\pi k}{n}\right) /;\, n \in \mathbb{N}^+$$

01.23.16.0037.01

$$\operatorname{csch}(nz) = \frac{\operatorname{csch}(z)}{U_{n-1}(\cosh(z))}$$

Products, sums, and powers of the direct function

Products of the direct function

01.23.16.0085.01

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

Products involving the direct function

01.23.16.0086.01

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

Sums of the direct function

01.23.16.0038.01

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

01.23.16.0039.01

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

Sums involving the direct function

Involving other hyperbolic functions

Involving sech

01.23.16.0043.01

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

01.23.16.0044.01

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

01.23.16.0045.01

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

01.23.16.0046.01

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

01.23.16.0047.01

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

Involving trigonometric functions

Involving csc

01.23.16.0048.01

$$\operatorname{csch}(z)+i\csc(z)=2i\cosh\left(\frac{e^{\frac{i\pi}{4}}z}{\sqrt{2}}\right)\sinh\left(\frac{e^{-\frac{1}{4}(i\pi)}z}{\sqrt{2}}\right)\csc(z)\operatorname{csch}(z)$$

01.23.16.0049.01

$$\operatorname{csch}(z)-i\csc(z)=-2i\cosh\left(\frac{e^{-\frac{1}{4}(i\pi)}z}{\sqrt{2}}\right)\sinh\left(\frac{e^{\frac{i\pi}{4}}z}{\sqrt{2}}\right)\csc(z)\operatorname{csch}(z)$$

01.23.16.0050.01

$$\operatorname{csch}(a)+i\csc(b)=2\cosh\left(\frac{a+ib}{2}\right)\sin\left(\frac{b+ia}{2}\right)\csc(b)\operatorname{csch}(a)$$

01.23.16.0051.01

$$\operatorname{csch}(a)-i\csc(b)=2\cosh\left(\frac{a-ib}{2}\right)\sin\left(\frac{b-ia}{2}\right)\csc(b)\operatorname{csch}(a)$$

Involving sec

01.23.16.0052.01

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

01.23.16.0053.01

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

01.23.16.0054.01

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

01.23.16.0055.01

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

Powers of the direct function

01.23.16.0040.01

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

Sums of powers involving the direct function

01.23.16.0041.01

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

01.23.16.0042.01

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

Identities

Functional identities

01.23.17.0001.01

$$4\operatorname{csch}^2(2z)\left(\operatorname{csch}^2(z)+1\right) = \operatorname{csch}^4(z)$$

01.23.17.0002.01

$$\operatorname{csch}^4(z_1)\operatorname{csch}^4(z_2) - 2\operatorname{csch}^2(z_1)\left(\operatorname{csch}^2(z_1)+\operatorname{csch}^2(z_2)+2\right)\operatorname{csch}^2(z_1+z_2)\operatorname{csch}^2(z_2) + \left(\operatorname{csch}^2(z_1)-\operatorname{csch}^2(z_2)\right)^2\operatorname{csch}^4(z_1+z_2) = 0$$

Complex characteristics

Real part

01.23.19.0001.01

$$\operatorname{Re}(\operatorname{csch}(x+iy)) = -\frac{2\cos(y)\sinh(x)}{\cos(2y)-\cosh(2x)}$$

01.23.19.0007.01

$$\operatorname{Re}(\operatorname{csch}(z)) = -\frac{2\cos(\operatorname{Im}(z))\sinh(\operatorname{Re}(z))}{\cos(2\operatorname{Im}(z))-\cosh(2\operatorname{Re}(z))}$$

Imaginary part

01.23.19.0002.01

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

01.23.19.0008.01

$$\operatorname{Im}(\operatorname{csch}(z)) = \frac{2\cosh(\operatorname{Re}(z))\sin(\operatorname{Im}(z))}{\cos(2\operatorname{Im}(z))-\cosh(2\operatorname{Re}(z))}$$

Absolute value

01.23.19.0003.01

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

01.23.19.0009.01

$$|\operatorname{csch}(z)| = \frac{\sqrt{2}}{\sqrt{\cosh(2\operatorname{Re}(z))-\cos(2\operatorname{Im}(z))}}$$

Argument

01.23.19.0004.01

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

01.23.19.0005.01

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

01.23.19.0010.01

$$\arg(\operatorname{csch}(z)) = \tan^{-1}\left(-\frac{\cos(\operatorname{Im}(z))\sinh(\operatorname{Re}(z))}{\cos(2\operatorname{Im}(z))-\cosh(2\operatorname{Re}(z))}, \frac{\cosh(\operatorname{Re}(z))\sin(\operatorname{Im}(z))}{\cos(2\operatorname{Im}(z))-\cosh(2\operatorname{Re}(z))}\right)$$

01.23.19.0011.01

$$\arg(\operatorname{csch}(z)) = \frac{1}{2}\left(\operatorname{sgn}\left(\frac{\operatorname{sgn}(\cosh(\operatorname{Re}(z))\sin(\operatorname{Im}(z)))}{\operatorname{sgn}(\cos(2\operatorname{Im}(z))-\cosh(2\operatorname{Re}(z)))}+\frac{1}{2}\right)\left(\pi-\frac{\pi\operatorname{sgn}(\cos(\operatorname{Im}(z))\sinh(\operatorname{Re}(z)))}{\operatorname{sgn}(\cosh(2\operatorname{Re}(z))-\cos(2\operatorname{Im}(z)))}\right)-2\tan^{-1}(\coth(\operatorname{Re}(z))\tan(\operatorname{Im}(z)))\right)$$

Conjugate value

01.23.19.0006.01

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

01.23.19.0012.01

$$\overline{\operatorname{csch}(z)} = \frac{1}{\cos(\operatorname{Im}(z))\sinh(\operatorname{Re}(z))-i\cosh(\operatorname{Re}(z))\sin(\operatorname{Im}(z))}$$

Signum value

01.23.19.0013.01

$$\operatorname{sgn}(\operatorname{csch}(x+i\,y)) = \frac{\sqrt{\cosh(2\,x)-\cos(2\,y)}}{\sqrt{2}\,\left(i\cosh(x)\sin(y)+\cos(y)\sinh(x)\right)}$$

01.23.19.0014.01

$$\operatorname{sgn}(\operatorname{csch}(z)) = \frac{\sqrt{\cosh(2\operatorname{Re}(z))-\cos(2\operatorname{Im}(z))}}{\sqrt{2}\,\left(i\cosh(\operatorname{Re}(z))\sin(\operatorname{Im}(z))+\cos(\operatorname{Im}(z))\sinh(\operatorname{Re}(z))\right)}$$

Differentiation

Low-order differentiation

01.23.20.0001.01

$$\frac{\partial\operatorname{csch}(z)}{\partial z} = -\coth(z)\operatorname{csch}(z)$$

01.23.20.0002.01

$$\frac{\partial^2\operatorname{csch}(z)}{\partial z^2} = \operatorname{csch}(z)\left(\coth^2(z)+\operatorname{csch}^2(z)\right)$$

Symbolic differentiation

01.23.20.0003.01

$$\frac{\partial^n\operatorname{csch}(z)}{\partial z^n} = (-1)^n\,n!\,z^{-n-1} - \sum_{k=1}^{\infty}\frac{\left(2^{2k-1}-1\right)B_{2k}\,z^{2k-n-1}}{k\,(2k-n-1)!}\;/;\;|z|<\pi\bigwedge n\in\mathbb{N}^+$$

01.23.20.0006.01

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

01.23.20.0004.01

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

01.23.20.0007.01

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

Victor Adamchik (2005)

Fractional integro-differentiation

01.23.20.0005.02

$$\frac{\partial^\alpha\operatorname{csch}(z)}{\partial z^\alpha} = \mathcal{FC}_{\exp}^{(\alpha)}(z,-1)\,z^{-\alpha-1} - \sum_{k=1}^{\infty}\frac{\left(2^{2k-1}-1\right)B_{2k}\,z^{2k-\alpha-1}}{\Gamma(2k-\alpha)\,k}\;/;\;|z|<\pi$$

01.23.20.0008.01

$$\operatorname{csch}^{(\alpha)}(c\,z) = i^{\alpha+1}\,2^{-\alpha}\,\pi^{-\alpha-1}\left((-i\,c\,z)^{\alpha}\,(i\,c\,z)^{-\alpha}\,\psi^{(\alpha)}\!\left(-\frac{i\,c\,z}{2\,\pi}\right)-\psi^{(\alpha)}\!\left(\frac{i\,c\,z}{2\,\pi}\right)\right)- i^{\alpha+1}\,\pi^{-\alpha-1}\left((-i\,c\,z)^{\alpha}\,(i\,c\,z)^{-\alpha}\,\psi^{(\alpha)}\!\left(-\frac{i\,c\,z}{\pi}\right)-\psi^{(\alpha)}\!\left(\frac{i\,c\,z}{\pi}\right)\right)+i^{\alpha+1}\lim_{\nu\to\alpha}\frac{(i\,c\,z)^{-\nu-1}}{\Gamma(-\nu)}\,(4\log(2)+2\log(\pi)-\log(-i\,c\,z)+\psi(-\nu)+\gamma)$$

Integration

Indefinite integration

Involving only one direct function

01.23.21.0019.01

$$\int \operatorname{csch}(b+a\,z)\,dz = \frac{\log\left(\tanh\left(\frac{1}{2}\,(b+a\,z)\right)\right)}{a}$$

01.23.21.0020.01

$$\int \operatorname{csch}(a\,z)\,dz = \frac{\log\left(\tanh\left(\frac{a\,z}{2}\right)\right)}{a}$$

01.23.21.0021.01

$$\int \operatorname{csch}(z)\,dz = \log\left(\tanh\left(\frac{z}{2}\right)\right)$$

Involving one direct function and elementary functions

Involving power function

Involving power

Involving z^n and linear arguments

01.23.21.0022.01

$$\int z\operatorname{csch}(b+a\,z)\,dz = \frac{1}{a^2}\left(b\log\left(1-e^{-b-a\,z}\right)+a\,z\log\left(1-e^{-b-a\,z}\right)- b\log\left(1+e^{-b-a\,z}\right)-a\,z\log\left(1+e^{-b-a\,z}\right)-b\log\left(\tanh\left(\frac{1}{2}\,(b+a\,z)\right)\right)+\operatorname{Li}_2\left(-e^{-b-a\,z}\right)-\operatorname{Li}_2\left(e^{-b-a\,z}\right)\right)$$

01.23.21.0023.01

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

01.23.21.0024.01

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

01.23.21.0025.01

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

01.23.21.0026.01

$$\int z^3 \operatorname{csch}(a z) \, dz = \frac{1}{8 a^4} \left(-2 a^4 z^4 - 8 a^3 \log(1 + e^{-a z}) z^3 + 8 a^3 \log(1 - e^{a z}) z^3 + 24 a^2 \operatorname{Li}_2(-e^{-a z}) z^2 + 24 a^2 \operatorname{Li}_2(e^{a z}) z^2 + 48 a \operatorname{Li}_3(-e^{-a z}) z - 48 a \operatorname{Li}_3(e^{a z}) z + \pi^4 + 48 \operatorname{Li}_4(-e^{-a z}) + 48 \operatorname{Li}_4(e^{a z})\right)$$

01.23.21.0027.01

$$\int z^4 \operatorname{csch}(a z) \, dz = \frac{1}{10 a^5} \left(-2 a^5 z^5 - 10 a^4 \log(1 + e^{-a z}) z^4 + 10 a^4 \log(1 - e^{a z}) z^4 + 40 a^3 \operatorname{Li}_2(-e^{-a z}) z^3 + 40 a^3 \operatorname{Li}_2(e^{a z}) z^3 + 120 a^2 \operatorname{Li}_3(-e^{-a z}) z^2 - 120 a^2 \operatorname{Li}_3(e^{a z}) z^2 + 240 a \operatorname{Li}_4(-e^{-a z}) z + 240 a \operatorname{Li}_4(e^{a z}) z - i \pi^5 + 240 \operatorname{Li}_5(-e^{-a z}) - 240 \operatorname{Li}_5(e^{a z})\right)$$

Involving exponential function

Involving exp

Involving $a^{b z}$

01.23.21.0028.01

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

01.23.21.0029.01

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

01.23.21.0030.01

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

01.23.21.0031.01

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

Involving exponential function and a power function

Involving exp and power

Involving $z^n e^{b z}$

01.23.21.0032.01

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

01.23.21.0033.01

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

01.23.21.0034.01

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

Arguments involving inverse trigonometric functions

Involving $\sin^{-1}$

01.23.21.0035.01

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

01.23.21.0036.01

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

Involving $\cos^{-1}$

01.23.21.0037.01

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

01.23.21.0038.01

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

Arguments involving inverse hyperbolic functions

Involving $\sinh^{-1}$

01.23.21.0039.01

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

01.23.21.0040.01

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

Involving $\cosh^{-1}$

01.23.21.0041.01

$$\int \operatorname{csch}\left(\cosh^{-1}(z)\right) dz = \frac{\sqrt{z-1}\, \log\left(z + \sqrt{z-1}\, \sqrt{z+1}\right)}{\sqrt{\frac{z-1}{z+1}}\, \sqrt{z+1}}$$

01.23.21.0042.01

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

Involving $\tanh^{-1}$

01.23.21.0043.01

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

Involving $\coth^{-1}$

01.23.21.0044.01

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

Involving csch^{-1}

01.23.21.0045.01

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

Involving sech^{-1}

01.23.21.0046.01

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

Involving trigonometric functions

Involving sin

Involving sin(*b z*)

01.23.21.0047.01

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

Involving power of sin

Involving sin^m(*b z*)

01.23.21.0048.01

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

Involving cos

Involving cos(*b z*)

01.23.21.0049.01

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

Involving power of cos

Involving cos^m(*b z*)

01.23.21.0050.01

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

Involving trigonometric and a power functions

Involving sin and power

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

01.23.21.0051.01

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

01.23.21.0052.01

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

Involving powers of sin and power

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

01.23.21.0053.01

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

Involving cos and power

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

01.23.21.0054.01

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

01.23.21.0055.01

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

Involving powers of cos and power

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

01.23.21.0056.01

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

Involving trigonometric and exponential functions

Involving sin and exp

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

01.23.21.0057.01

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

01.23.21.0058.01

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

01.23.21.0059.01

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

Involving powers of sin and exp

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

01.23.21.0060.01

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

Involving cos and exp

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

01.23.21.0061.01

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

01.23.21.0062.01

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

01.23.21.0063.01

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

Involving powers of cos and exp

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

01.23.21.0064.01

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

Involving trigonometric, exponential and a power functions

Involving sin, exp and power

Involving $z^n e^{pz} \sin(a+bz)\operatorname{csch}(cz)$

01.23.21.0065.01

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

01.23.21.0066.01

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

01.23.21.0067.01

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

01.23.21.0068.01

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

Involving powers of sin, exp and power

Involving $z^n e^{pz} \sin^m(bz)\operatorname{csch}(cz)$

01.23.21.0069.01

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

Involving cos, exp and power

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

01.23.21.0070.01

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

01.23.21.0071.01

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

01.23.21.0072.01

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

01.23.21.0073.01

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

Involving powers of cos, exp and power

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

01.23.21.0074.01

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

Involving hyperbolic functions

Involving sinh

Involving $\sinh(b z)$

01.23.21.0075.01

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

01.23.21.0076.01

$$\int \sinh(z)\operatorname{csch}(z)\,dz = z$$

01.23.21.0077.01

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

01.23.21.0078.01

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

01.23.21.0079.01

$$\int \sinh(z)\operatorname{csch}(4z)\,dz = \left(\frac{1}{4}-\frac{i}{4}\right)\left((-1-i)\tan^{-1}\left(\tanh\left(\frac{z}{2}\right)\right)+\sqrt[4]{-1}\,\tan^{-1}\left(\frac{\tanh\left(\frac{z}{2}\right)+i}{\sqrt{2}}\right)+(-1)^{3/4}\tanh^{-1}\left(\frac{-i\tanh\left(\frac{z}{2}\right)-1}{\sqrt{2}}\right)\right)$$

01.23.21.0080.01

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

01.23.21.0081.01

$$\int \sinh(3z)\operatorname{csch}(z)\,dz = z+\sinh(2z)$$

01.23.21.0082.01

$$\int \sinh(4z)\operatorname{csch}(z)\,dz = \frac{2}{3}(3\sinh(z)+\sinh(3z))$$

Involving power of sinh

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

01.23.21.0083.01

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

01.23.21.0084.01

$$\int \sinh^{\mu}(cz)\operatorname{csch}(cz)\,dz = -\frac{\cosh(cz)\sinh^{\mu}(cz)\left(-\sinh^2(cz)\right)^{-\frac{\mu}{2}}}{c}\,{}_2F_1\left(\frac{1}{2},1-\frac{\mu}{2};\frac{3}{2};\cosh^2(cz)\right)$$

01.23.21.0085.01

$$\int \sinh^2(z)\operatorname{csch}(2z)\,dz = \frac{1}{2}\log(\cosh(z))$$

01.23.21.0086.01

$$\int \sinh^3(z)\,\operatorname{csch}(3 z)\,dz = \frac{1}{4}\left(z - \sqrt{3}\,\tan^{-1}\left(\frac{\tanh(z)}{\sqrt{3}}\right)\right)$$

01.23.21.0087.01

$$\int \sinh^{\frac{1}{2}}(c z)\,\operatorname{csch}(c z)\,dz = -\frac{2\sinh^{\frac{1}{2}}(c z)}{c\sqrt{i\sinh(c z)}}\,F\left(\frac{1}{4}(\pi - 2 i c z)\,\middle|\,2\right)$$

01.23.21.0088.01

$$\int \frac{\operatorname{csch}(c z)}{\sinh^{\frac{1}{2}}(c z)}\,dz = -\frac{2}{c\sinh^{\frac{1}{2}}(c z)}\left(\cosh(c z) - E\left(\frac{1}{4}(\pi - 2 i c z)\,\middle|\,2\right)\sqrt{i\sinh(c z)}\right)$$

01.23.21.0089.01

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

01.23.21.0090.01

$$\int \sinh^3(z)\,\operatorname{csch}(4 z)\,dz = \frac{1}{8}\left(4\tan^{-1}\left(\tanh\left(\frac{z}{2}\right)\right) - (1 - i)\sqrt[4]{-1}\,\tan^{-1}\left(\frac{\tanh\left(\frac{z}{2}\right) + i}{\sqrt{2}}\right) + i\sqrt{2}\,\tanh^{-1}\left(\frac{i\tanh\left(\frac{z}{2}\right) + 1}{\sqrt{2}}\right)\right)$$

Involving rational functions of sinh

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

01.23.21.0091.01

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

01.23.21.0092.01

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

01.23.21.0093.01

$$\int \frac{(A + B\sinh(z))\operatorname{csch}(z)}{a + b\sinh(z)}\,dz =$$

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

Involving algebraic functions of sinh

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

01.23.21.0094.01

$$\int \sqrt{a+b\sinh(c\,z)}\,\operatorname{csch}(c\,z)\,dz = \frac{2\,i\left(b\,F\left(\frac{1}{4}(\pi-2\,i\,c\,z)\,\middle|\,-\frac{2\,i\,b}{a-i\,b}\right)+i\,a\,\Pi\left(2;\,\frac{1}{4}(\pi-2\,i\,c\,z)\,\middle|\,-\frac{2\,i\,b}{a-i\,b}\right)\right)\sqrt{\frac{a+b\sinh(c\,z)}{a-i\,b}}}{c\sqrt{a+b\sinh(c\,z)}}$$

01.23.21.0095.01

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

01.23.21.0096.01

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

01.23.21.0097.01

$$\int \frac{\operatorname{csch}(c\,z)}{\sqrt{a+b\sinh(c\,z)}}\,dz = -\frac{2}{c\sqrt{a+b\sinh(c\,z)}}\sqrt{\frac{a+b\sinh(c\,z)}{a-i\,b}}\;\Pi\left(2;\,\frac{1}{4}(\pi-2\,i\,c\,z)\,\middle|\,-\frac{2\,i\,b}{a-i\,b}\right)$$

01.23.21.0098.01

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

01.23.21.0099.01

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

Involving cosh

Involving cosh(*b z*)

01.23.21.0100.01

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

01.23.21.0101.01

$$\int \cosh(z)\,\text{csch}(z)\,dz = \log(\sinh(z))$$

01.23.21.0102.01

$$\int \cosh(z)\,\text{csch}(2\,z)\,dz = \frac{1}{2}\log\!\left(\sinh\!\left(\frac{z}{2}\right)\right) - \frac{1}{2}\log\!\left(\cosh\!\left(\frac{z}{2}\right)\right)$$

01.23.21.0103.01

$$\int \cosh(z)\,\text{csch}(3\,z)\,dz = \frac{1}{6}\,(2\log(\sinh(z)) - \log(2\cosh(2\,z)+1))$$

01.23.21.0104.01

$$\int \cosh(z)\,\text{csch}(4\,z)\,dz = \frac{1}{4}\left(\sqrt[4]{-1}\,(-1-i)\tan^{-1}\!\left(\frac{i+\tanh\left(\frac{z}{2}\right)}{\sqrt{2}}\right) + \sqrt{2}\,\tanh^{-1}\!\left(\frac{i\tanh\left(\frac{z}{2}\right)+1}{\sqrt{2}}\right) - \log\!\left(\cosh\!\left(\frac{z}{2}\right)\right) + \log\!\left(\sinh\!\left(\frac{z}{2}\right)\right)\right)$$

01.23.21.0105.01

$$\int \cosh(2\,z)\,\text{csch}(z)\,dz = 2\cosh(z) - \log\!\left(\cosh\!\left(\frac{z}{2}\right)\right) + \log\!\left(\sinh\!\left(\frac{z}{2}\right)\right)$$

01.23.21.0106.01

$$\int \cosh(3\,z)\,\text{csch}(z)\,dz = \cosh(2\,z) + \log(\sinh(z))$$

01.23.21.0107.01

$$\int \cosh(4\,z)\,\text{csch}(z)\,dz = 2\cosh(z) + \frac{2}{3}\cosh(3\,z) - \log\!\left(\cosh\!\left(\frac{z}{2}\right)\right) + \log\!\left(\sinh\!\left(\frac{z}{2}\right)\right)$$

Involving power of cosh

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

01.23.21.0108.01

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

01.23.21.0109.01

$$\int \cosh^{\mu}(c\,z)\,\text{csch}(c\,z)\,dz = \frac{\cosh^{\mu+1}(c\,z)\,\coth^2(c\,z)^{-\frac{\mu}{2}-\frac{1}{2}}\,\text{csch}^2(c\,z)}{c\,\mu-c}\,{}_2F_1\!\left(\frac{1}{2}-\frac{\mu}{2}, \frac{1}{2}-\frac{\mu}{2}; \frac{3}{2}-\frac{\mu}{2}; -\text{csch}^2(c\,z)\right)$$

01.23.21.0110.01

$$\int \sqrt{\cosh^2(z)}\,\text{csch}(z)\,dz = \sqrt{\cosh^2(z)}\,\log(\sinh(z))\,\text{sech}(z)$$

01.23.21.0111.01

$$\int \cosh^2(z)\operatorname{csch}(3z)\,dz = \frac{1}{12}\left(-4\log\left(\cosh\left(\frac{z}{2}\right)\right) - \log(2\cosh(z)-1) + \log(2\cosh(z)+1) + 4\log\left(\sinh\left(\frac{z}{2}\right)\right)\right)$$

01.23.21.0112.01

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

01.23.21.0113.01

$$\int \frac{\operatorname{csch}(cz)}{\cosh^{\frac{1}{2}}(cz)}\,dz = -\frac{2\coth^2(cz)^{3/4}}{3c\cosh^{\frac{3}{2}}(cz)}\,{}_2F_1\left(\frac{3}{4},\frac{3}{4};\frac{7}{4};-\operatorname{csch}^2(cz)\right)$$

01.23.21.0114.01

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

01.23.21.0115.01

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

Involving rational functions of cosh

Involving $\frac{1}{a+b\cosh(dz)}$

01.23.21.0116.01

$$\int \frac{\operatorname{csch}(z)}{a+b\cosh(z)}\,dz = \frac{-(a+b)\log\left(\cosh\left(\frac{z}{2}\right)\right) + b\log(a+b\cosh(z)) + (a-b)\log\left(\sinh\left(\frac{z}{2}\right)\right)}{(a-b)(a+b)}$$

01.23.21.0117.01

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

01.23.21.0118.01

$$\int \frac{A+B\operatorname{csch}(z)}{1-\cosh(z)}\,dz = \frac{1}{4}\left(4A\coth\left(\frac{z}{2}\right) + B\left(\operatorname{csch}^2\left(\frac{z}{2}\right) - 2\log\left(\cosh\left(\frac{z}{2}\right)\right) + 2\log\left(\sinh\left(\frac{z}{2}\right)\right)\right)\right)$$

01.23.21.0119.01

$$\int \frac{A+B\operatorname{csch}(z)}{\cosh(z)+1}\,dz = \frac{1}{2\cosh(z)+2}\left(-\cosh(z)\log\left(\cosh\left(\frac{z}{2}\right)\right)B - \log\left(\cosh\left(\frac{z}{2}\right)\right)B + \cosh(z)\log\left(\sinh\left(\frac{z}{2}\right)\right)B + \log\left(\sinh\left(\frac{z}{2}\right)\right)B + B + 2A\sinh(z)\right)$$

01.23.21.0120.01

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

01.23.21.0121.01

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

01.23.21.0122.01

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

Involving algebraic functions of cosh

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

01.23.21.0123.01

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

01.23.21.0124.01

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

01.23.21.0125.01

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

01.23.21.0126.01

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

01.23.21.0127.01

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

01.23.21.0128.01

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

01.23.21.0129.01

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

Involving $(a + b\cosh(2 c z))^\beta$

01.23.21.0130.01

$$\int (a + b\cosh(2cz))^\beta \operatorname{csch}(cz)\,dz = \frac{1}{4c\beta}\left(\left(F_1\left(-2\beta; -\beta, -\beta; 1-2\beta; -\frac{\sqrt{2-\frac{2a}{b}}+2}{2(\cosh(cz)-1)}, \frac{\sqrt{2-\frac{2a}{b}}-2}{2\cosh(cz)-2}\right)\left(\frac{2\cosh(cz)+\sqrt{2-\frac{2a}{b}}}{\cosh(cz)-1}\right)^{-\beta}\left(\frac{2\cosh(cz)-\sqrt{2-\frac{2a}{b}}}{4\cosh(cz)-4}\right)^{-\beta} - F_1\left(-2\beta; -\beta, -\beta; 1-2\beta; -\frac{\sqrt{2-\frac{2a}{b}}-2}{2(\cosh(cz)+1)}, \frac{\sqrt{2-\frac{2a}{b}}+2}{2\cosh(cz)+2}\right)\left(\frac{2\cosh(cz)+\sqrt{2-\frac{2a}{b}}}{\cosh(cz)+1}\right)^{-\beta}\left(\frac{2\cosh(cz)-\sqrt{2-\frac{2a}{b}}}{4\cosh(cz)+4}\right)^{-\beta}\right)(a+b\cosh(2cz))^\beta\right)$$

01.23.21.0131.01

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

01.23.21.0132.01

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

01.23.21.0133.01

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

01.23.21.0134.01

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

01.23.21.0135.01

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

01.23.21.0136.01

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

01.23.21.0137.01

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

Involving tanh

Involving tanh($c\,z$)

01.23.21.0138.01

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

01.23.21.0139.01

$$\int \tanh(z)\,\operatorname{csch}(2\,z)\,dz = \frac{\tanh(z)}{2}$$

Involving power of tanh

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

01.23.21.0140.01

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

01.23.21.0141.01

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

01.23.21.0142.01

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

01.23.21.0143.01

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

Involving coth

Involving coth($c\,z$)

01.23.21.0144.01

$$\int \coth(c\,z)\,\operatorname{csch}(c\,z)\,dz = -\frac{\operatorname{csch}(c\,z)}{c}$$

Involving power of coth

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

01.23.21.0145.01

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

01.23.21.0146.01

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

01.23.21.0147.01

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

01.23.21.0148.01

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

01.23.21.0149.01

$$\int \coth^4(c\,z)\,\operatorname{csch}(c\,z)\,dz = -\frac{\coth(c\,z)\operatorname{csch}(c\,z)\left(2\operatorname{csch}^2(c\,z)+5\right)+3\log\left(\cosh\left(\frac{c\,z}{2}\right)\right)-3\log\left(\sinh\left(\frac{c\,z}{2}\right)\right)}{8\,c}$$

Involving sinh and cosh

01.23.21.0150.01

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

01.23.21.0151.01

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

01.23.21.0152.01

$$\int \sqrt{\cosh(a\,z)\sinh(a\,z)}\,\operatorname{csch}(a\,z)\,dz = -\frac{2\cosh(a\,z)\sqrt{\cosh(a\,z)\sinh(a\,z)}}{3\,a\sqrt[4]{-\sinh^2(a\,z)}}\,{}_2F_1\!\left(\frac{3}{4},\frac{3}{4};\frac{7}{4};\cosh^2(a\,z)\right)$$

01.23.21.0153.01

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\sqrt{\frac{a-c+(a+c)\cosh(2\,z)+b\sinh(2\,z)}{(\cosh(z)+1)^2}}$$

$$\Big(\text{Root}\big[$$

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

$$2\big]-\tanh\Big($$

$$\frac{z}{2}\Big)\Big)$$

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\sqrt{a - c + (a + c)\cosh(2\,z) + b\sinh(2\,z)}\;\sqrt{\mathrm{sech}^4\left(\frac{z}{2}\right)(a - c + (a + c)\cosh(2\,z) + b\sinh(2\,z))}$$

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

Involving sinh and coth

01.23.21.0154.01

$$\int \frac{A + B\coth(z) + C\,\mathrm{csch}(z)}{a + b\sinh(z)}\,dz = \frac{1}{a\sqrt{-a^2 - b^2}}$$

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

Involving cosh and tanh

01.23.21.0155.01

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

01.23.21.0156.01

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

01.23.21.0157.01

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

01.23.21.0158.01

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

01.23.21.0159.01

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

01.23.21.0160.01

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

01.23.21.0161.01

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

Involving cosh and coth

01.23.21.0162.01

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

01.23.21.0163.01

$$\int \frac{A + B\coth(z) + C\operatorname{csch}(z)}{1 - \cosh(z)}\, dz = \frac{1}{4}\left((B+C)\operatorname{csch}^2\left(\frac{z}{2}\right) + 4\,A\coth\left(\frac{z}{2}\right) + 2\,(B-C)\left(\log\left(\cosh\left(\frac{z}{2}\right)\right) - \log\left(\sinh\left(\frac{z}{2}\right)\right)\right)\right)$$

01.23.21.0164.01

$$\int \frac{A + B\coth(z) + C\operatorname{csch}(z)}{\cosh(z) + 1}\, dz = \frac{-2\,(B+C)\left(\log\left(\cosh\left(\frac{z}{2}\right)\right) - \log\left(\sinh\left(\frac{z}{2}\right)\right)\right)\cosh^2\left(\frac{z}{2}\right) - B + C + 2\,A\sinh(z)}{2\,(\cosh(z)+1)}$$

01.23.21.0165.01

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

01.23.21.0166.01

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

Involving hyperbolic and a power functions

Involving sinh and power

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

01.23.21.0167.01

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

01.23.21.0168.01

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

Involving power of sinh and power

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

01.23.21.0169.01

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

Involving cosh and power

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

01.23.21.0170.01

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

01.23.21.0171.01

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

01.23.21.0172.01

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

Involving power of cosh and power

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

01.23.21.0173.01

$$\int z^n \coth^u(c z) \operatorname{csch}(c z) \, dz = -2^{1-u} \left(1 - e^{2 c z}\right)^u \binom{u}{\frac{u}{2}} \operatorname{csch}^u(c z) \, n! \, (1 - u \bmod 2) \, e^{c z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c (u+1))^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{u+1}{2}, \ldots, \frac{u+1}{2}, 1+u; \frac{u+3}{2}, \ldots, \frac{u+3}{2}; e^{2 c z}\right) - 2^{1-u} e^{c z} \left(1 - e^{2 c z}\right)^u \operatorname{csch}^u(c z) \, n! \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(e^{-c(-2 s+u) z} \sum_{j=0}^{n} \frac{1}{(n-j)!} (-1)^j z^{n-j} (c (2 s+1))^{-j-1} \, {}_{j+2}F_{j+1}\left(\frac{2 s+1}{2}, \ldots, \frac{2 s+1}{2}, u+1; \frac{2 s+3}{2}, \ldots, \frac{2 s+3}{2}; e^{2 c z}\right) + e^{c(-2 s+u) z} \sum_{j=0}^{n} \frac{1}{(n-j)!} (-1)^j z^{n-j} (c (2 u-2 s+1))^{-j-1} \, {}_{j+2}F_{j+1}\left(\frac{2 u-2 s+1}{2}, \ldots, \frac{2 u-2 s+1}{2}, u+1; \frac{2 u-2 s+3}{2}, \ldots, \frac{2 u-2 s+3}{2}; e^{2 c z}\right)\right) /; n \in \mathbb{N} \bigwedge u \in \mathbb{N}^+$$

Involving tanh and power

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

01.23.21.0174.01

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

01.23.21.0175.01

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

Involving powers of tanh and power

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

01.23.21.0176.01

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

01.23.21.0177.01

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

Involving coth and power

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

01.23.21.0178.01

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

01.23.21.0179.01

$$\int z\coth(c\,z)\operatorname{csch}(c\,z)\,dz = -\frac{1}{c^2}\left(c\,z\operatorname{csch}(c\,z)+\log\left(\cosh\left(\frac{c\,z}{2}\right)\right)-\log\left(\sinh\left(\frac{c\,z}{2}\right)\right)\right)$$

Involving powers of coth and power

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

01.23.21.0180.01

$$\int z^n \coth^u(c z)\,\text{csch}(c z)\,dz = -2^{1-u}\left(1-e^{2 c z}\right)^u \binom{u}{\frac{u}{2}} \text{csch}^u(c z)\, n!\,(1-u \bmod 2)$$
$$e^{c z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c (u+1))^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{u+1}{2}, \ldots, \frac{u+1}{2}, 1+u; \frac{u+3}{2}, \ldots, \frac{u+3}{2}; e^{2 c z}\right) -$$
$$2^{1-u} e^{c z} \left(1-e^{2 c z}\right)^u \text{csch}^u(c z)\, n! \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s}$$
$$\left(e^{-c(-2 s+u) z} \sum_{j=0}^{n} \frac{1}{(n-j)!} (-1)^j z^{n-j} (c (2 s+1))^{-j-1} \, {}_{j+2}F_{j+1}\left(\frac{2 s+1}{2}, \ldots, \frac{2 s+1}{2}, u+1; \frac{2 s+3}{2}, \ldots, \frac{2 s+3}{2}; e^{2 c z}\right) + \right.$$
$$e^{c(-2 s+u) z} \sum_{j=0}^{n} \frac{1}{(n-j)!} (-1)^j z^{n-j} (c (2 u-2 s+1))^{-j-1}$$
$$\left. {}_{j+2}F_{j+1}\left(\frac{2 u-2 s+1}{2}, \ldots, \frac{2 u-2 s+1}{2}, u+1; \frac{2 u-2 s+3}{2}, \ldots, \frac{2 u-2 s+3}{2}; e^{2 c z}\right)\right) /; n \in \mathbb{N} \land u \in \mathbb{N}^+$$

Involving hyperbolic and exponential functions

Involving sinh and exp

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

01.23.21.0181.01

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

01.23.21.0182.01

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

01.23.21.0183.01

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

Involving powers of sinh and exp

Involving $e^{p z} \sinh^m(b z)\,\text{csch}(c z)$

01.23.21.0184.01

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

01.23.21.0185.01

$$\int e^{pz}\sinh^\mu(cz)\,\operatorname{csch}(cz)\,dz = -\frac{2\,e^{(c+p)z}\sinh^\mu(cz)\left(1-e^{2cz}\right)^{-\mu}}{-\mu c+c+p}\,{}_2F_1\!\left(\frac{-\mu c+c+p}{2c},1-\mu;\frac{-\mu c+3c+p}{2c};e^{2cz}\right)$$

01.23.21.0186.01

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

Involving cosh and exp

Involving $e^{pz}\cosh(bz)\operatorname{csch}(cz)$

01.23.21.0187.01

$$\int e^{pz}\cosh(bz)\,\operatorname{csch}(cz)\,dz = -e^{cz}\left(\frac{e^{(b+p)z}\,{}_2F_1\!\left(\frac{b+c+p}{2c},1;\frac{b+c+p}{2c}+1;e^{2cz}\right)}{b+c+p} - \frac{e^{(p-b)z}\,{}_2F_1\!\left(\frac{-b+c+p}{2c},1;\frac{-b+c+p}{2c}+1;e^{2cz}\right)}{b-c-p}\right)$$

01.23.21.0188.01

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

01.23.21.0189.01

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

Involving powers of cosh and exp

Involving $e^{pz}\cosh^m(bz)\operatorname{csch}(cz)$

01.23.21.0190.01

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

01.23.21.0191.01

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

01.23.21.0192.01

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

Involving tanh and exp

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

01.23.21.0193.01

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

01.23.21.0194.01

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

Involving powers of tanh and exp

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

01.23.21.0195.01

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

01.23.21.0196.01

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

Involving coth and exp

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

01.23.21.0197.01

$$\int e^{p z} \coth(c z) \operatorname{csch}(c z)\, dz = \frac{2 c\, e^{(c+p) z}}{c (c+p) (3 c+p)} \left((3 c+p)\, {}_2F_1\left(\frac{c+p}{2 c}, 2; \frac{3 c+p}{2 c}; e^{2 c z}\right) + e^{2 c z} (c+p)\, {}_2F_1\left(\frac{3 c+p}{2 c}, 2; \frac{5 c+p}{2 c}; e^{2 c z}\right)\right)$$

01.23.21.0198.01

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

Involving powers of coth and exp

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

01.23.21.0199.01

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

01.23.21.0200.01

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

Involving hyperbolic and trigonometric functions

Involving sin and sinh

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

01.23.21.0201.01

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

Involving powers of sin and powers of sinh

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

01.23.21.0202.01

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

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

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

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

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

$$2^{-m-u+1}\,e^{c z}\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^{k+s}\binom{m}{s}\binom{u}{k}\left((-1)^u\left(\frac{e^{\frac{i \pi m}{2}+(-i a (m-2 s)-b (u-2 k)) z}}{c-i a (m-2 s)-b (u-2 k)}\,{}_2F_1\!\left(\frac{b k}{c}+\frac{i a s}{c}+\frac{1}{2}-\frac{i a m}{2 c}-\right.\right.\right.$$

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

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

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

$$\frac{e^{(a i (m-2 s)+b (u-2 k)) z-\frac{i m \pi}{2}}}{c+a i (m-2 s)+b (u-2 k)}$$

$$\left.{}_2F_1\!\left(-\frac{b k}{c}+\frac{i a m}{2 c}+\frac{b u}{2 c}+\frac{1}{2}-\frac{i a s}{c},1;-\frac{b k}{c}+\frac{i a m}{2 c}+\frac{b u}{2 c}+\frac{3}{2}-\frac{i a s}{c};e^{2 c z}\right)\right)\;/;\;m\in\mathbb{N}^+\bigwedge u\in\mathbb{N}^+$$

01.23.21.0203.01

$$\int \sin^m(a z) \sinh^\mu(c z) \operatorname{csch}(c z)\, dz = -\frac{2^{1-m} e^{c z} (1 - m \bmod 2) \sinh^\mu(c z) \left(1 - e^{2 c z}\right)^{-\mu}}{c (1-\mu)} \binom{m}{\frac{m}{2}} {}_2F_1\!\left(\frac{c - c\mu}{2 c}, 1-\mu; \frac{3-\mu}{2}; e^{2 c z}\right) - 2^{1-m} e^{c z} \sinh^\mu(c z) \left(1 - e^{2 c z}\right)^{-\mu} \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left(\frac{e^{\frac{i \pi m}{2} + a i (2k-m) z}}{a i (2k-m) + c(1-\mu)} {}_2F_1\!\left(\frac{-\mu c + c + a i (2k-m)}{2 c}, 1-\mu; \frac{a i (2k-m) + c(3-\mu)}{2 c}; e^{2 c z}\right) + \frac{e^{i a (m-2k) z - \frac{i m \pi}{2}}}{a i (m-2k) + c(1-\mu)} {}_2F_1\!\left(\frac{-\mu c + c + a i (m-2k)}{2 c}, 1-\mu; \frac{a i (m-2k) + c(3-\mu)}{2 c}; e^{2 c z}\right)\right)$$

Involving cos and sinh

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

01.23.21.0204.01

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

Involving powers of cos and powers of sinh

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

01.23.21.0205.01

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

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

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

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

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

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

$$(-i a (m - 2 s) + b (u - 2 k) + c) + \left(e^{(a i (m-2 s) + b (u-2 k)) z}\, {}_2F_1\left(-\frac{b k}{c} + \frac{i a m}{2 c} + \frac{b u}{2 c} + \frac{1}{2} - \frac{i a s}{c}, \right.\right.$$

$$\left.\left. 1; -\frac{b k}{c} + \frac{i a m}{2 c} + \frac{b u}{2 c} + \frac{3}{2} - \frac{i a s}{c}; e^{2 c z}\right) \right) \Big/ (a i (m - 2 s) + b (u - 2 k) + c) +$$

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

$$(-i a (m - 2 s) - b (u - 2 k) + c) + \left((-1)^u\, e^{(i a (m-2 s) - b (u-2 k)) z}\, {}_2F_1\left(\frac{b k}{c} + \frac{i a m}{2 c} + \frac{1}{2} - \frac{i a s}{c} - \frac{b u}{2 c}, 1; \right.\right.$$

$$\left.\left.\left. \frac{b k}{c} + \frac{i a m}{2 c} + \frac{3}{2} - \frac{i a s}{c} - \frac{b u}{2 c}; e^{2 c z}\right) \right) \Big/ (a i (m - 2 s) - b (u - 2 k) + c) \right) /; m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

01.23.21.0206.01

$$\int \cos^m(a z) \sinh^\mu(c z) \operatorname{csch}(c z)\, dz =$$

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

$$\left. \frac{e^{i a (m - 2 k) z}\, {}_2F_1\left(\frac{a i (m - 2 k) - c \mu + c}{2 c}, 1 - \mu; \frac{a i (m - 2 k) + c (-\mu + 3)}{2 c}; e^{2 c z}\right)}{a i (m - 2 k) + c (1 - \mu)} \right) +$$

$$\frac{2^{-m-\mu+1}\, e^{c z} \left(-e^{-c z} + e^{c z}\right)^\mu \left(1 - e^{2 c z}\right)^{-\mu}}{c (\mu - 1)} \binom{m}{\frac{m}{2}}\, {}_2F_1\left(\frac{1 - \mu}{2}, 1 - \mu; \frac{3 - \mu}{2}; e^{2 c z}\right) (1 - m \bmod 2) /; m \in \mathbb{N}^+$$

Involving sin and cosh

Involving $\sin(a\,z)\cosh(b\,z)\operatorname{csch}(c\,z)$

01.23.21.0207.01

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

Involving powers of sin and powers of cosh

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

01.23.21.0208.01

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

01.23.21.0209.01

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

Involving cos and cosh

Involving cos(a z) cosh(b z) csch(c z)

01.23.21.0210.01

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

Involving powers of cos and powers of cosh

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

01.23.21.0211.01

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

01.23.21.0212.01

$$\int \cos^m(a z)\cosh^\mu(c z)\operatorname{csch}(c z)\,dz = \frac{2^{1-m}\cosh^\mu(c z)(1-m \bmod 2)\left(1+e^{-2 c z}\right)^{-\mu}}{c(\mu-1)}\binom{m}{\frac{m}{2}} e^{-c z} F_1\left(-\frac{1}{2}(\mu-1); -\mu, 1; \frac{3-\mu}{2}; -e^{-2 c z}, e^{-2 c z}\right) + 2^{1-m} e^{-c z}\cosh^\mu(c z)\left(1+e^{-2 c z}\right)^{-\mu}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(\frac{e^{(2 i a s-i a m) z}}{\mu c-c-i a m+2 i a s} F_1\left(\frac{-\mu c+c+i a m-2 i a s}{2 c}; -\mu, 1; \frac{i a m-2 i a s+c(3-\mu)}{2 c}; -e^{-2 c z}, e^{-2 c z}\right) + \frac{e^{i a (m-2 s) z}}{\mu c-c+a i (m-2 s)} F_1\left(-\frac{\mu c-c+i a m-2 i a s}{2 c}; -\mu, 1; -\frac{i a m-2 i a s+c(\mu-3)}{2 c}; -e^{-2 c z}, e^{-2 c z}\right)\right)$$

Involving sin and tanh

Involving sin(a z) tanh(c z) csch(c z)

01.23.21.0213.01

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

Involving powers of sin and powers of tanh

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

01.23.21.0214.01

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

Involving cos and tanh

Involving cos(a z) tanh(c z) csch(c z)

01.23.21.0215.01

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

Involving powers of cos and powers of tanh

Involving $\cos^m(a z)\tanh^u(c z)\operatorname{csch}(c z)$

01.23.21.0216.01

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

Involving sin and coth

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

01.23.21.0217.01

$$\int \sin(a z)\coth(c z)\operatorname{csch}(c z)\,dz = \frac{1}{(a-i c)(c-i a)}\left(e^{-(c+i a) z}\left((c+i a)e^{2 i a z}F_1\left(\frac{c-i a}{2c};-1,2;\frac{1}{2}\left(3-\frac{i a}{c}\right);-e^{-2cz},e^{-2cz}\right)+(a+i c)\, i\, F_1\left(\frac{c+i a}{2c};-1,2;\frac{1}{2}\left(3+\frac{i a}{c}\right);-e^{-2cz},e^{-2cz}\right)\right)\right)$$

Involving powers of sin and powers of coth

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

01.23.21.0218.01

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

01.23.21.0219.01

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

Involving cos and coth

Involving cos(*a z*) coth(*c z*) csch(*c z*)

01.23.21.0220.01

$$\int \cos(a z)\coth(c z)\operatorname{csch}(c z)\,dz = \frac{1}{(a+i c)(c+i a)}\left(e^{-(c+i a) z}\left((a-i c)\,e^{2 i a z} F_1\left(\frac{c-i a}{2 c}; -1, 2; \frac{1}{2}\left(3-\frac{i a}{c}\right); -e^{-2 c z}, e^{-2 c z}\right) - (a+i c)\, F_1\left(\frac{c+i a}{2 c}; -1, 2; \frac{1}{2}\left(3+\frac{i a}{c}\right); -e^{-2 c z}, e^{-2 c z}\right)\right)\right)$$

Involving powers of cos and powers of coth

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

01.23.21.0221.01

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

01.23.21.0222.01

$$\int \cos^m(a z)\coth^u(c z)\operatorname{csch}(c z)\,dz = -2^{-m-u+1} e^{c z}\left(1-e^{2 c z}\right)^u \binom{m}{\frac{m}{2}}(1-m \bmod 2)\operatorname{csch}^u(c z) \sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{k}\left(\frac{e^{-c(u-2k)z}\,{}_2F_1\left(k+\frac{1}{2}, u+1; k+\frac{3}{2}; e^{2 c z}\right)}{c(2k+1)}+\frac{e^{c(u-2k)z}\,{}_2F_1\left(-k+u+\frac{1}{2}, u+1; -k+u+\frac{3}{2}; e^{2 c z}\right)}{c(-2k+2u+1)}\right)-$$

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

$$\left.\frac{e^{i a(m-2s)z}\,{}_2F_1\left(\frac{i a m}{2c}+\frac{u}{2}+\frac{1}{2}-\frac{i a s}{c}, u+1; \frac{i a m}{2c}+\frac{u}{2}+\frac{3}{2}-\frac{i a s}{c}; e^{2 c z}\right)}{(u+1)c+a i(m-2s)}\right)-2^{-m-u+1} e^{c z}\left(1-e^{2 c z}\right)^u \operatorname{csch}^u(c z)$$

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

$$(c(2k+1)-i a(m-2s))+\left(e^{(i a(m-2s)-c(u-2k))z}\right.$$

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

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

$$(c(-2k+2u+1)-i a(m-2s))+\left(e^{(a i(m-2s)+c(u-2k))z}\,{}_2F_1\left(-k+\frac{i a m}{2c}+u+\frac{1}{2}-\frac{i a s}{c},\right.\right.$$

$$\left.\left.\left.u+1; -k+\frac{i a m}{2c}+u+\frac{3}{2}-\frac{i a s}{c}; e^{2 c z}\right)\right)\Big/((-2k+2u+1)c+a i(m-2s))\right)-$$

$$\frac{1}{c(u+1)}2^{-m-u+1} e^{c z}\left(1-e^{2 c z}\right)^u \binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}\operatorname{csch}^u(c z)\,{}_2F_1\left(\frac{u+1}{2}, u+1; \frac{u+3}{2}; e^{2 c z}\right)(1-m \bmod 2)$$

$$(1-u \bmod 2)\;/;\; m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

Involving hyperbolic, exponential and a power functions

Involving sinh, exp and power

Involving $z^n e^{p z}\sinh(a+b z)\operatorname{csch}(c z)$

01.23.21.0223.01

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

01.23.21.0224.01

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

01.23.21.0225.01

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

01.23.21.0226.01

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

01.23.21.0227.01

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

01.23.21.0228.01

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

Involving powers of sinh, exp and power

Involving $z^n e^{pz} \sinh^u(b z) \operatorname{csch}(c z)$

01.23.21.0229.01

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

Involving cosh, exp and power

Involving $z^n e^{pz} \cosh(a + b z) \operatorname{csch}(c z)$

01.23.21.0230.01

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

01.23.21.0231.01

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

01.23.21.0232.01

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

01.23.21.0233.01

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

01.23.21.0234.01

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

01.23.21.0235.01

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

Involving powers of cosh, exp and power

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

01.23.21.0236.01

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

Involving tanh, exp and power

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

01.23.21.0237.01

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

01.23.21.0238.01

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

01.23.21.0239.01

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

Involving powers of tanh, exp and power

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

01.23.21.0240.01

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

Involving coth, exp and power

Involving $z^n e^{pz}\coth(cz)\operatorname{csch}(cz)$

01.23.21.0241.01

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

01.23.21.0242.01

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

01.23.21.0243.01

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

Involving powers of coth, exp and power

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

01.23.21.0244.01

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

Involving hyperbolic, exponential and trigonometric functions

Involving sin, sinh and exp

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

01.23.21.0245.01

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

Involving powers of sin, powers of sinh and exp

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

01.23.21.0246.01

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

01.23.21.0247.01

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

Involving cos, sinh and exp

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

01.23.21.0248.01

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

Involving powers of cos, powers of sinh and exp

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

01.23.21.0249.01

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

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

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

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

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

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

01.23.21.0250.01

$$\int e^{pz}\cos^m(az)\sinh^\mu(cz)\operatorname{csch}(cz)\,dz = \frac{1}{-\mu c+c+p}2^{1-m}e^{(c+p)z}\left(1-e^{2cz}\right)^{-\mu}\binom{m}{\frac{m}{2}}{}_2F_1\left(\frac{-\mu c+c+p}{2c},1-\mu;\frac{-\mu c+3c+p}{2c};e^{2cz}\right)(m \bmod 2-1)\sinh^\mu(cz)- 2^{1-m}e^{cz}\left(1-e^{2cz}\right)^{-\mu}\sinh^\mu(cz)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\left(\frac{e^{(ai(2k-m)+p)z}\,{}_2F_1\left(\frac{ai(2k-m)+p-c\mu+c}{2c},1-\mu;\frac{ai(2k-m)+p+c(-\mu+3)}{2c};e^{2cz}\right)}{ai(2k-m)+p+c(1-\mu)}+\frac{e^{(ai(m-2k)+p)z}\,{}_2F_1\left(\frac{ai(m-2k)+p-c\mu+c}{2c},1-\mu;\frac{ai(m-2k)+p+c(-\mu+3)}{2c};e^{2cz}\right)}{ai(m-2k)+p+c(1-\mu)}\right)\;/;\;m\in\mathbb{N}^+$$

Involving sin, cosh and exp

Involving $e^{pz}\sin(az)\cosh(bz)\operatorname{csch}(cz)$

01.23.21.0251.01

$$\int e^{pz}\sin(az)\cosh(bz)\operatorname{csch}(cz)\,dz = \frac{i\,e^{bz}\left(e^{-bz}+e^{bz}\right)\left(1-e^{2cz}\right)}{2\left(1+e^{2bz}\right)\left(-1+e^{2cz}\right)}\left(i\left(\frac{e^{(b+c-ia+p)z}}{a+i(b+c+p)}\,{}_2F_1\left(1,\frac{b+c-ia+p}{2c};\frac{b+3c-ia+p}{2c};e^{2cz}\right)+\frac{e^{(b+c+ia+p)z}}{a-i(b+c+p)}\,{}_2F_1\left(1,\frac{b+c+ia+p}{2c};\frac{b+3c+ia+p}{2c};e^{2cz}\right)\right)+\frac{e^{(-b+c-ia+p)z}}{-b+c-ia+p}\,{}_2F_1\left(1,\frac{-b+c-ia+p}{2c};\frac{-b+3c-ia+p}{2c};e^{2cz}\right)-\frac{e^{(-b+c+ia+p)z}}{-b+c+ia+p}\,{}_2F_1\left(1,\frac{-b+c+ia+p}{2c};\frac{-b+3c+ia+p}{2c};e^{2cz}\right)\right)$$

Involving powers of sin, powers of cosh and exp

Involving $e^{pz}\sin^m(az)\cosh^u(bz)\operatorname{csch}(cz)$

01.23.21.0252.01

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

01.23.21.0253.01

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

Involving cos, cosh and exp

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

01.23.21.0254.01

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

Involving powers of cos, powers of cosh and exp

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

01.23.21.0255.01

$$\int e^{pz}\cos^m(az)\cosh^u(bz)\operatorname{csch}(cz)\,dz = -\frac{2^{-m-u+1}e^{(c+p)z}}{c+p}\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}(m \bmod 2-1)(u \bmod 2-1)\,{}_2F_1\left(\frac{c+p}{2c},1;\frac{c+p}{2c}+1;e^{2cz}\right)+2^{-m-u+1}e^{cz}\binom{u}{\frac{u}{2}}(u \bmod 2-1)\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(\frac{e^{(p-ia(m-2s))z}}{c+p-ia(m-2s)}\,{}_2F_1\left(\frac{c+p-ia(m-2s)}{2c},1;\frac{c+p-ia(m-2s)}{2c}+1;e^{2cz}\right)+\frac{e^{(p+ai(m-2s))z}}{c+p+ai(m-2s)}\,{}_2F_1\left(\frac{c+p+ai(m-2s)}{2c},1;\frac{c+p+ai(m-2s)}{2c}+1;e^{2cz}\right)\right)+2^{-m-u+1}e^{cz}\binom{m}{\frac{m}{2}}(m \bmod 2-1)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{k}\left(\frac{e^{(p+b(u-2k))z}}{c+p+b(u-2k)}\,{}_2F_1\left(\frac{c+b(u-2k)+p}{2c},1;\frac{c+b(u-2k)+p}{2c}+1;e^{2cz}\right)+\frac{e^{(p-b(u-2k))z}}{c+p-b(u-2k)}\,{}_2F_1\left(\frac{c-b(u-2k)+p}{2c},1;\frac{c-b(u-2k)+p}{2c}+1;e^{2cz}\right)\right)-2^{-m-u+1}e^{cz}\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\binom{u}{k}\left(\frac{e^{(p+ai(m-2s)+b(u-2k))z}}{c+p+ai(m-2s)+b(u-2k)}\,{}_2F_1\left(\frac{c+p+ai(m-2s)+b(u-2k)}{2c},1;\frac{c+p+ai(m-2s)+b(u-2k)}{2c}+1;e^{2cz}\right)+\frac{e^{(p-ia(m-2s)+b(u-2k))z}}{c+p-ia(m-2s)+b(u-2k)}\,{}_2F_1\left(\frac{c+p-ia(m-2s)+b(u-2k)}{2c},1;\frac{c+p-ia(m-2s)+b(u-2k)}{2c}+1;e^{2cz}\right)+\frac{e^{(p+ai(m-2s)-b(u-2k))z}}{c+p+ai(m-2s)-b(u-2k)}\,{}_2F_1\left(\frac{c-b(u-2k)+p+ai(m-2s)}{2c},1;\frac{c-b(u-2k)+p+ai(m-2s)}{2c}+1;e^{2cz}\right)+\frac{e^{(p-ia(m-2s)-b(u-2k))z}}{c+p-ia(m-2s)-b(u-2k)}\,{}_2F_1\left(\frac{c+p-ia(m-2s)-b(u-2k)}{2c},1;\frac{c+p-ia(m-2s)-b(u-2k)}{2c}+1;e^{2cz}\right)\right)\;/;\;m\in\mathbb{N}^+\bigwedge u\in\mathbb{N}^+$$

01.23.21.0256.01

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

Involving sin, tanh and exp

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

01.23.21.0257.01

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

Involving powers of sin, powers of tanh and exp

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

01.23.21.0258.01

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

Involving cos, tanh and exp

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

01.23.21.0259.01

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

Involving powers of cos, powers of tanh and exp

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

01.23.21.0260.01

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

Involving sin, coth and exp

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

01.23.21.0261.01

$$\int e^{p z} \sin(a z) \coth(c z) \operatorname{csch}(c z)\, dz = i e^{-c z} \left(\frac{e^{(-i a+p) z} F_1\left(\frac{c+i a-p}{2 c}; -1, 2; \frac{3 c+i a-p}{2 c}; -e^{-2 c z}, e^{-2 c z}\right)}{-c-i a+p} + \frac{e^{(i a+p) z} F_1\left(-\frac{-c+i a+p}{2 c}; -1, 2; -\frac{-3 c+i a+p}{2 c}; -e^{-2 c z}, e^{-2 c z}\right)}{c-i a-p} \right)$$

Involving powers of sin, powers of coth and exp

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

01.23.21.0262.01

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

01.23.21.0263.01

$$\int e^{p z} \sin^m(a z) \coth^u(c z) \operatorname{csch}(c z)\, dz = 2^{-m-u}\left(1-e^{2 c z}\right)^{u+1}\binom{m}{\frac{m}{2}}(1-m \bmod 2)\left(\frac{e^{p z}}{(u+1) c+p}\binom{u}{\frac{u}{2}}\, {}_2F_1\left(\frac{(u+1) c+p}{2 c}, u+1; \frac{(u+1) c+p}{2 c}+1; e^{2 c z}\right)(1-u \bmod 2)+\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(\frac{e^{(p-c(u-2 s)) z}}{(2 s+1) c+p}\, {}_2F_1\left(\frac{(2 s+1) c+p}{2 c}, u+1; \frac{(2 s+1) c+p}{2 c}+1; e^{2 c z}\right)+\frac{e^{(p+c(u-2 s)) z}}{(-2 s+2 u+1) c+p}\, {}_2F_1\left(\frac{(-2 s+2 u+1) c+p}{2 c}, u+1; \frac{(-2 s+2 u+1) c+p}{2 c}+1; e^{2 c z}\right)\right)\right) \operatorname{csch}^{u+1}(c z)+2^{-m-u}\left(1-e^{2 c z}\right)^{u+1}\left(\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(e^{\frac{i m \pi}{2}}\left(\frac{e^{(p-i a(m-2 k)) z}}{(u+1) c-i a(m-2 k)+p}\binom{u}{\frac{u}{2}}\, {}_2F_1\left(\frac{(u+1) c+(p-i a(m-2 k))}{2 c}, u+1; \frac{(u+1) c+(p-i a(m-2 k))}{2 c}+1; e^{2 c z}\right)(1-u \bmod 2)+\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(\frac{e^{(-i a(m-2 k)+p-c(u-2 s)) z}}{(2 s+1) c-i a(m-2 k)+p}\, {}_2F_1\left(\frac{(2 s+1) c+(p-i a(m-2 k))}{2 c}, u+1; \frac{(2 s+1) c+(p-i a(m-2 k))}{2 c}+1; e^{2 c z}\right)+\left(e^{(-i a(m-2 k)+p+c(u-2 s)) z}\, {}_2F_1\left(\frac{(-2 s+2 u+1) c+(p-i a(m-2 k))}{2 c}, u+1; \frac{(-2 s+2 u+1) c+(p-i a(m-2 k))}{2 c}+1; e^{2 c z}\right)\right) \Big/ ((-2 s+2 u+1) c-i a(m-2 k)+p)\right)\right)+$$

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

Involving cos, coth and exp

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

01.23.21.0264.01

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

Involving powers of cos, powers of coth and exp

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

01.23.21.0265.01

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

01.23.21.0266.01

$$\int e^{pz}\cos^m(az)\coth^u(cz)\operatorname{csch}(cz)\,dz = -\frac{1}{(u+1)c+p}2^{-m-u+1}e^{(c+p)z}\left(1-e^{2cz}\right)^u\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}(1-m\bmod 2)(1-u\bmod 2)\operatorname{csch}^u(cz)\,{}_2F_1\left(\frac{(u+1)c+p}{2c},u+1;\frac{(u+1)c+p}{2c}+1;e^{2cz}\right)-2^{-m-u+1}e^{cz}\left(1-e^{2cz}\right)^u\binom{m}{\frac{m}{2}}(1-m\bmod 2)\operatorname{csch}^u(cz)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{k}\left(\frac{e^{(p+c(u-2k))z}\,{}_2F_1\left(\frac{(-2k+2u+1)c+p}{2c},u+1;\frac{(-2k+2u+1)c+p}{2c}+1;e^{2cz}\right)}{(-2k+2u+1)c+p}+\frac{e^{(p-c(u-2k))z}\,{}_2F_1\left(\frac{c+p}{2c}+k,u+1;\frac{c+p}{2c}+k+1;e^{2cz}\right)}{(2k+1)c+p}\right)-2^{-m-u+1}e^{cz}\left(1-e^{2cz}\right)^u\binom{u}{\frac{u}{2}}(1-u\bmod 2)\operatorname{csch}^u(cz)\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(\frac{e^{(p+ai(m-2s))z}\,{}_2F_1\left(\frac{(u+1)c+p+ai(m-2s)}{2c},u+1;\frac{(u+1)c+p+ai(m-2s)}{2c}+1;e^{2cz}\right)}{(u+1)c+p+ai(m-2s)}+\frac{e^{(p-ia(m-2s))z}\,{}_2F_1\left(\frac{(u+1)c+p-ia(m-2s)}{2c},u+1;\frac{(u+1)c+p-ia(m-2s)}{2c}+1;e^{2cz}\right)}{(u+1)c+p-ia(m-2s)}\right)-2^{-m-u+1}e^{cz}\left(1-e^{2cz}\right)^u\operatorname{csch}^u(cz)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\binom{u}{k}\left(\left(e^{(p+ai(m-2s)-c(u-2k))z}\,{}_2F_1\left(\frac{(2k+1)c+p+ai(m-2s)}{2c},u+1;\frac{(2k+1)c+p+ai(m-2s)}{2c}+1;e^{2cz}\right)\right)\Big/((2k+1)c+p+ai(m-2s))+\left(e^{(p-ia(m-2s)-c(u-2k))z}\,{}_2F_1\left(\frac{(2k+1)c+p-ia(m-2s)}{2c},u+1;\frac{(2k+1)c+p-ia(m-2s)}{2c}+1;e^{2cz}\right)\right)\Big/((2k+1)c+p-ia(m-2s))+\left(e^{(p+ai(m-2s)+c(u-2k))z}\,{}_2F_1\left(\frac{(-2k+2u+1)c+p+ai(m-2s)}{2c},u+1;\frac{(-2k+2u+1)c+p+ai(m-2s)}{2c}+1;e^{2cz}\right)\right)\Big/((-2k+2u+1)c+p+ai(m-2s))+\left(e^{(p-ia(m-2s)+c(u-2k))z}\,{}_2F_1\left(\frac{(-2k+2u+1)c+p-ia(m-2s)}{2c},u+1;\frac{(-2k+2u+1)c+p-ia(m-2s)}{2c}+1;e^{2cz}\right)\right)\Big/((-2k+2u+1)c+p-ia(m-2s))\right)\,/;\,m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

Involving hyperbolic, trigonometric and a power functions

Involving sin, sinh and power

Involving $z^n\sin(az)\sinh(bz)\operatorname{csch}(cz)$

01.23.21.0267.01

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

Involving powers of sin, powers of sinh and power

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

01.23.21.0268.01

$$\int z^n \sin^m(a z) \sinh^u(b z) \operatorname{csch}(c z) \, dz = -i^u 2^{-m-u+1} e^{cz} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! (1 - m \bmod 2)(1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} c^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{1}{2}, \ldots, \frac{1}{2}, 1; \frac{3}{2}, \ldots, \frac{3}{2}; e^{2cz} \right) + i^{m+u} 2^{-m-u+1} e^{cz} \binom{u}{\frac{u}{2}} n! (u \bmod 2 - 1) \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^s \binom{m}{s} \left((-1)^m e^{(a i (m-2s))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (a i (m-2s)+c)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{a i (m-2s)+c}{2c}, \ldots, \frac{a i (m-2s)+c}{2c}, 1; \frac{a i (m-2s)+3c}{2c}, \ldots, \frac{a i (m-2s)+3c}{2c}; e^{2cz} \right) + e^{(-ia(m-2s))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-ia(m-2s)+c)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{-ia(m-2s)+c}{2c}, \ldots, \frac{-ia(m-2s)+c}{2c}, 1; \frac{-ia(m-2s)+3c}{2c}, \ldots, \frac{-ia(m-2s)+3c}{2c}; e^{2cz} \right) \right) + 2^{-m-u+1} e^{cz} \binom{m}{\frac{m}{2}} n! (m \bmod 2 - 1) \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{u}{k} \left(e^{(b(u-2k))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b(u-2k)+c)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{b(u-2k)+c}{2c}, \ldots, \frac{b(u-2k)+c}{2c}, \right. \right.$$

$$1;\ \frac{b\,(u-2\,k)+3\,c}{2\,c},\ \ldots,\ \frac{b\,(u-2\,k)+3\,c}{2\,c};\ e^{2\,c\,z}\Bigg)+(-1)^u\, e^{(-b\,(u-2\,k))\,z} \sum_{j=0}^{n} \frac{(-1)^j\, z^{n-j}\,(-b\,(u-2\,k)+c)^{-j-1}}{(n-j)\,!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{-b\,(u-2\,k)+c}{2\,c},\ \ldots,\ \frac{-b\,(u-2\,k)+c}{2\,c},\ 1;\ \frac{-b\,(u-2\,k)+3\,c}{2\,c},\ \ldots,\ \frac{-b\,(u-2\,k)+3\,c}{2\,c};\ e^{2\,c\,z}\Bigg)\Bigg)-$$

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

$${}_{j+2}F_{j+1}\Bigg(\frac{-i\,a\,(m-2\,s)+b\,(-2\,k+u)+c}{2\,c},\ \ldots,\ \frac{-i\,a\,(m-2\,s)+b\,(-2\,k+u)+c}{2\,c},\ 1;$$

$$\frac{-i\,a\,(m-2\,s)+b\,(-2\,k+u)+3\,c}{2\,c},\ \ldots,\ \frac{-i\,a\,(m-2\,s)+b\,(-2\,k+u)+3\,c}{2\,c};\ e^{2\,c\,z}\Bigg)+$$

$$(-1)^u\, e^{-\frac{1}{2}\,i\,m\,\pi+(i\,a\,(-2\,s+m)-b\,(-2\,k+u))\,z} \sum_{j=0}^{n} \frac{(-1)^j\, z^{n-j}\,(i\,a\,(m-2\,s)-b\,(-2\,k+u)+c)^{-j-1}}{(n-j)\,!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{i\,a\,(m-2\,s)-b\,(-2\,k+u)+c}{2\,c},\ \ldots,\ \frac{i\,a\,(m-2\,s)-b\,(-2\,k+u)+c}{2\,c},\ 1;$$

$$\frac{i\,a\,(m-2\,s)-b\,(-2\,k+u)+3\,c}{2\,c},\ \ldots,\ \frac{i\,a\,(m-2\,s)-b\,(-2\,k+u)+3\,c}{2\,c};\ e^{2\,c\,z}\Bigg)+$$

$$(-1)^u\, e^{\frac{i\,m\,\pi}{2}+(-i\,a\,(-2\,s+m)-b\,(-2\,k+u))\,z} \sum_{j=0}^{n} \frac{(-1)^j\, z^{n-j}\,(-i\,a\,(m-2\,s)-b\,(-2\,k+u)+c)^{-j-1}}{(n-j)\,!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{-i\,a\,(m-2\,s)-b\,(-2\,k+u)+c}{2\,c},\ \ldots,\ \frac{-i\,a\,(m-2\,s)-b\,(-2\,k+u)+c}{2\,c},\ 1;$$

$$\frac{-i\,a\,(m-2\,s)-b\,(-2\,k+u)+3\,c}{2\,c},\ \ldots,\ \frac{-i\,a\,(m-2\,s)-b\,(-2\,k+u)+3\,c}{2\,c};\ e^{2\,c\,z}\Bigg)+$$

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

$$\Bigg(\frac{i\,a\,(m-2\,s)+b\,(-2\,k+u)+c}{2\,c},\ \ldots,\ \frac{i\,a\,(m-2\,s)+b\,(-2\,k+u)+c}{2\,c},\ 1;\ \frac{i\,a\,(m-2\,s)+b\,(-2\,k+u)+3\,c}{2\,c},$$

$$\ldots,\ \frac{i\,a\,(m-2\,s)+b\,(-2\,k+u)+3\,c}{2\,c};\ e^{2\,c\,z}\Bigg)\Bigg)\ /;\ n\in\mathbb{N}\bigwedge m\in\mathbb{N}^+\bigwedge u\in\mathbb{N}^+$$

Involving cos, sinh and power

Involving $z^n \cos(a\,z)\sinh(b\,z)\operatorname{csch}(c\,z)$

01.23.21.0269.01

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

Involving powers of cos, powers of sinh and power

Involving $z^n \cos^m(a z) \sinh^u(b z) \operatorname{csch}(c z)$

01.23.21.0270.01

$$\int z^n \cos^m(a z) \sinh^u(b z) \operatorname{csch}(c z)\, dz = -i^u 2^{-m-u+1} e^{c z} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n!\, (1 - m \bmod 2)(1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j c^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{1}{2}, \ldots, \frac{1}{2}, 1; \frac{3}{2}, \ldots, \frac{3}{2}; e^{2 c z}\right) + i^u 2^{-m-u+1} e^{c z} \binom{u}{\frac{u}{2}} n!\, (u \bmod 2 - 1) \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \Bigg(e^{-i a (m-2 s) z} \sum_{j=0}^{n} \frac{(-1)^j (c - i a (m-2 s))^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c - i a (m-2 s)}{2 c}, \ldots, \frac{c - i a (m-2 s)}{2 c}, 1; \frac{c - i a (m-2 s)}{2 c} + 1, \ldots, \frac{c - i a (m-2 s)}{2 c} + 1; e^{2 c z}\right) + e^{i a (m-2 s) z} \sum_{j=0}^{n} \frac{(-1)^j (c + a i (m-2 s))^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c + i a (m-2 s)}{2 c}, \ldots, \frac{c + i a (m-2 s)}{2 c}, 1; \frac{c + i a (m-2 s)}{2 c} + 1, \ldots, \frac{c + i a (m-2 s)}{2 c} + 1; e^{2 c z}\right)\Bigg) + 2^{-m-u+1} e^{c z} \binom{m}{\frac{m}{2}} n!\, (m \bmod 2 - 1) \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{u}{k} \Bigg((-1)^u e^{-b (u-2 k) z} \sum_{j=0}^{n} \frac{(-1)^j (c - b (u-2 k))^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c - b (u-2 k)}{2 c}, \ldots, \frac{c - b (u-2 k)}{2 c}, 1; \frac{c - b (u-2 k)}{2 c} + 1, \ldots, \frac{c - b (u-2 k)}{2 c} + 1; e^{2 c z}\right) + e^{b (u-2 k) z} \sum_{j=0}^{n} \frac{(-1)^j (c + b (u-2 k))^{-j-1} z^{n-j}}{(n-j)!}$$

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

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

$$ {}_{j+2}F_{j+1}\left(\frac{c-i\,a\,(m-2\,s)-b\,(u-2\,k)}{2\,c}, \ldots, \frac{c-i\,a\,(m-2\,s)-b\,(u-2\,k)}{2\,c}, 1; \frac{c-i\,a\,(m-2\,s)-b\,(u-2\,k)}{2\,c}+1, \ldots, \frac{c-i\,a\,(m-2\,s)-b\,(u-2\,k)}{2\,c}+1; e^{2\,c\,z}\right) + $$

$$ (-1)^u\, e^{(i\,a\,(m-2\,s)-b\,(u-2\,k))\,z} \sum_{j=0}^{n} \frac{(-1)^j\,(c+a\,i\,(m-2\,s)-b\,(u-2\,k))^{-j-1}\,z^{n-j}}{(n-j)!} $$

$$ {}_{j+2}F_{j+1}\left(\frac{c+i\,a\,(m-2\,s)-b\,(u-2\,k)}{2\,c}, \ldots, \frac{c+i\,a\,(m-2\,s)-b\,(u-2\,k)}{2\,c}, 1; \frac{c+i\,a\,(m-2\,s)-b\,(u-2\,k)}{2\,c}+1, \ldots, \frac{c+i\,a\,(m-2\,s)-b\,(u-2\,k)}{2\,c}+1; e^{2\,c\,z}\right) + $$

$$ e^{(b\,(u-2\,k)-i\,a\,(m-2\,s))\,z} \sum_{j=0}^{n} \frac{(-1)^j\,(c-i\,a\,(m-2\,s)+b\,(u-2\,k))^{-j-1}\,z^{n-j}}{(n-j)!} $$

$$ {}_{j+2}F_{j+1}\left(\frac{c-i\,a\,(m-2\,s)+b\,(u-2\,k)}{2\,c}, \ldots, \frac{c-i\,a\,(m-2\,s)+b\,(u-2\,k)}{2\,c}, 1; \frac{c-i\,a\,(m-2\,s)+b\,(u-2\,k)}{2\,c}+1, \ldots, \frac{c-i\,a\,(m-2\,s)+b\,(u-2\,k)}{2\,c}+1; e^{2\,c\,z}\right) + $$

$$ e^{(a\,i\,(m-2\,s)+b\,(u-2\,k))\,z} \sum_{j=0}^{n} \frac{(-1)^j\,(c+a\,i\,(m-2\,s)+b\,(u-2\,k))^{-j-1}\,z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1} $$

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

Involving sin, cosh and power

Involving $z^n \sin(a\,z) \cosh(b\,z) \operatorname{csch}(c\,z)$

01.23.21.0271.01

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

Involving powers of sin, powers of cosh and power

Involving $z^n \sin^m(a z) \cosh^u(b z) \operatorname{csch}(c z)$

01.23.21.0272.01

$$\int z^n \sin^m(a z) \cosh^u(b z) \operatorname{csch}(c z)\, dz = -2^{-m-u+1} e^{c z} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! (1 - m \bmod 2)(1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j c^{-j-1} z^{n-j}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{1}{2}, \ldots, \frac{1}{2}, 1; \frac{3}{2}, \ldots, \frac{3}{2}; e^{2 c z}\right) + 2^{-m-u} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left(-2 e^{\frac{i \pi m}{2} + (c - i a (m - 2 k)) z} n! \sum_{j=0}^{n} \frac{(-1)^j (c - i a (m - 2 k))^{-j-1} z^{n-j}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c - i a (m - 2 k)}{2 c}, \ldots, \frac{c - i a (m - 2 k)}{2 c}, 1; \frac{c - i a (m - 2 k)}{2 c} + 1, \ldots, \frac{c - i a (m - 2 k)}{2 c} + 1; e^{2 c z}\right) - 2 e^{(c + a i (m - 2 k)) z - \frac{i m \pi}{2}} n! \sum_{j=0}^{n} \frac{(-1)^j (c + a i (m - 2 k))^{-j-1} z^{n-j}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c + i a (m - 2 k)}{2 c}, \ldots, \frac{c + i a (m - 2 k)}{2 c}, 1; \frac{c + i a (m - 2 k)}{2 c} + 1, \ldots, \frac{c + i a (m - 2 k)}{2 c} + 1; e^{2 c z}\right)\right) + 2^{-m-u} \binom{m}{\frac{m}{2}} (1 - m \bmod 2) \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(-2 e^{(c - b (u - 2 s)) z} n! \sum_{j=0}^{n} \frac{(-1)^j (c - b (u - 2 s))^{-j-1} z^{n-j}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c - b (u - 2 s)}{2 c}, \ldots, \frac{c - b (u - 2 s)}{2 c}, 1;\right.\right.$$

$$\frac{c-b(u-2s)}{2c}+1, \ldots, \frac{c-b(u-2s)}{2c}+1; e^{2cz}\Bigg) - 2e^{(c+b(u-2s))z}\, n! \sum_{j=0}^{n} \frac{(-1)^j (c+b(u-2s))^{-j-1} z^{n-j}}{(n-j)!}$$

$$_{j+2}F_{j+1}\Bigg(\frac{c+b(u-2s)}{2c}, \ldots, \frac{c+b(u-2s)}{2c}, 1; \frac{c+b(u-2s)}{2c}+1, \ldots, \frac{c+b(u-2s)}{2c}+1; e^{2cz}\Bigg)\Bigg) +$$

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

$$_{j+2}F_{j+1}\Bigg(\frac{c-ia(m-2k)-b(u-2s)}{2c}, \ldots, \frac{c-ia(m-2k)-b(u-2s)}{2c}, 1;$$

$$\frac{c-ia(m-2k)-b(u-2s)}{2c}+1, \ldots, \frac{c-ia(m-2k)-b(u-2s)}{2c}+1; e^{2cz}\Bigg) -$$

$$2e^{(c+ai(m-2k)-b(u-2s))z-\frac{im\pi}{2}}\, n! \sum_{j=0}^{n} \frac{(-1)^j (c+ai(m-2k)-b(u-2s))^{-j-1} z^{n-j}}{(n-j)!}$$

$$_{j+2}F_{j+1}\Bigg(\frac{c+ia(m-2k)-b(u-2s)}{2c}, \ldots, \frac{c+ia(m-2k)-b(u-2s)}{2c}, 1;$$

$$\frac{c+ia(m-2k)-b(u-2s)}{2c}+1, \ldots, \frac{c+ia(m-2k)-b(u-2s)}{2c}+1; e^{2cz}\Bigg) -$$

$$2e^{\frac{i\pi m}{2}+(c-ia(m-2k)+b(u-2s))z}\, n! \sum_{j=0}^{n} \frac{(-1)^j (c-ia(m-2k)+b(u-2s))^{-j-1} z^{n-j}}{(n-j)!}$$

$$_{j+2}F_{j+1}\Bigg(\frac{c-ia(m-2k)+b(u-2s)}{2c}, \ldots, \frac{c-ia(m-2k)+b(u-2s)}{2c}, 1;$$

$$\frac{c-ia(m-2k)+b(u-2s)}{2c}+1, \ldots, \frac{c-ia(m-2k)+b(u-2s)}{2c}+1; e^{2cz}\Bigg) -$$

$$2e^{(c+ai(m-2k)+b(u-2s))z-\frac{im\pi}{2}}\, n! \sum_{j=0}^{n} \frac{(-1)^j (c+ai(m-2k)+b(u-2s))^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}$$

$$\Bigg(\frac{c+ia(m-2k)+b(u-2s)}{2c}, \ldots, \frac{c+ia(m-2k)+b(u-2s)}{2c}, 1; \frac{c+ia(m-2k)+b(u-2s)}{2c}+$$

$$1, \ldots, \frac{c+ia(m-2k)+b(u-2s)}{2c}+1; e^{2cz}\Bigg)\Bigg) /; n \in \mathbb{N} \land m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

Involving cos, cosh and power

Involving $z^n \cos(a z) \cosh(b z) \operatorname{csch}(c z)$

01.23.21.0273.01

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

Involving powers of cos, powers of cosh and power

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

01.23.21.0274.01

$$\int z^n \cos^m(a z) \cosh^u(b z) \operatorname{csch}(c z) \, dz = -2^{-m-u+1} e^{c z} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! (1-m \bmod 2)(1-u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} c^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{1}{2}, \ldots, \frac{1}{2}, 1; \frac{3}{2}, \ldots, \frac{3}{2}; e^{2 c z}\right) + 2^{-m-u+1} e^{c z} \binom{u}{\frac{u}{2}} n! (u \bmod 2-1) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left(e^{(a i (m-2 k)) z} \sum_{j=0}^{n} \frac{1}{(n-j)!} (-1)^j z^{n-j} (a i (m-2 k)+c)^{-j-1} {}_{j+2}F_{j+1}\left(\frac{a i (m-2 k)+c}{2 c}, \ldots, \frac{a i (m-2 k)+c}{2 c}, 1; \frac{a i (m-2 k)+c}{2 c}+1, \ldots, \frac{a i (m-2 k)+c}{2 c}+1; e^{2 c z}\right) + e^{(-i a (m-2 k)) z} \sum_{j=0}^{n} \frac{1}{(n-j)!} (-1)^j z^{n-j} (-i a (m-2 k)+c)^{-j-1} {}_{j+2}F_{j+1}\left(\frac{-i a (m-2 k)+c}{2 c}, \ldots, \frac{-i a (m-2 k)+c}{2 c}, 1; \frac{-i a (m-2 k)+c}{2 c}+1, \ldots, \frac{-i a (m-2 k)+c}{2 c}+1; e^{2 c z}\right)\right) + 2^{-m-u+1} e^{c z} \binom{m}{\frac{m}{2}} n! (m \bmod 2-1) \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(e^{(b (u-2 s)) z} \sum_{j=0}^{n} \frac{1}{(n-j)!} (-1)^j z^{n-j} (b (u-2 s)+c)^{-j-1} {}_{j+2}F_{j+1}\left(\frac{b (u-2 s)+c}{2 c}, \ldots, \frac{b (u-2 s)+c}{2 c}, 1; \frac{b (u-2 s)+c}{2 c}+1, \ldots, \frac{b (u-2 s)+c}{2 c}+1; e^{2 c z}\right) + \right.$$

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

$$2^{1-m-u}e^{cz}n!\sum_{k=0}^{\lfloor\frac{m-1}{2}\rfloor}\sum_{s=0}^{\lfloor\frac{u-1}{2}\rfloor}\binom{m}{k}\binom{u}{s}\Bigg(e^{(a i(m-2k)-b(u-2s))z}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^j z^{n-j}(a i(m-2k)-b(u-2s)+c)^{-j-1}$$

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

$$e^{(-i a(m-2k)+b(u-2s))z}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^j z^{n-j}(-i a(m-2k)+b(u-2s)+c)^{-j-1}$$

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

$$e^{(-i a(m-2k)-b(u-2s))z}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^j z^{n-j}(-i a(m-2k)-b(u-2s)+c)^{-j-1}$$

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

$$e^{(a i(m-2k)+b(u-2s))z}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^j z^{n-j}(a i(m-2k)+b(u-2s)+c)^{-j-1}\,{}_{j+2}F_{j+1}$$

$$\left(\frac{a i(m-2k)+b(u-2s)+c}{2c},\ldots,\frac{a i(m-2k)+b(u-2s)+c}{2c},1;\frac{a i(m-2k)+b(u-2s)+c}{2c}+1,\ldots,\frac{a i(m-2k)+b(u-2s)+c}{2c}+1;e^{2cz}\right)\Bigg)\Bigg)\;/;\;n\in\mathbb{N}\land m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

Involving powers of sin, powers of tanh and power

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

01.23.21.0275.01

$$\int z^n\sin^m(a z)\tanh^u(c z)\operatorname{csch}(c z)\,dz = i^{u-1}2^{1-m}e^{cuz}\binom{m}{\frac{m}{2}}\binom{u-1}{\frac{u-1}{2}}n!\,(1-m\bmod 2)$$

$$(1-(u-1)\bmod 2)\sum_{j=0}^{n}\frac{(-1)^j(cu)^{-j-1}z^{n-j}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{u}{2},\ldots,\frac{u}{2},u;\frac{u}{2}+1,\ldots,\frac{u}{2}+1;-e^{2cz}\right)+$$

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

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

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

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

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

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

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

$$\left.\left.u;\,\frac{2\,k+3}{2},\,\ldots,\,\frac{2\,k+3}{2};\,-e^{2\,c\,z}\right)\right)+2^{1-m}\,e^{\frac{i\pi m}{2}+c\,u\,z}\,n!$$

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

$${}_{j+2}F_{j+1}\left(\frac{c\,(-2\,i+2\,u-1)-i\,a\,(m-2\,k)}{2\,c},\,\ldots,\,\frac{c\,(-2\,i+2\,u-1)-i\,a\,(m-2\,k)}{2\,c},\,u;\right.$$

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

$$(-1)^{u-1}\,e^{(-i\,a\,(m-2\,k)-c\,(-2\,i+u-1))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(c\,(2\,i+1)-i\,a\,(m-2\,k))^{-j-1}\,z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c\,(2\,i+1)-i\,a\,(m-2\,k)}{2\,c},\,\ldots,\,\frac{c\,(2\,i+1)-i\,a\,(m-2\,k)}{2\,c},\,u;\,\frac{c\,(2\,i+1)-i\,a\,(m-2\,k)}{2\,c}+\right.$$

$$\left.\left.1,\,\ldots,\,\frac{c\,(2\,i+1)-i\,a\,(m-2\,k)}{2\,c}+1;\,-e^{2\,c\,z}\right)\right)+2^{1-m}\,e^{c\,u\,z-\frac{i\,m\,\pi}{2}}\,n!$$

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

$${}_{j+2}F_{j+1}\left(\frac{(-2\,i+2\,u-1)\,c+a\,i\,(m-2\,k)}{2\,c},\,\ldots,\,\frac{(-2\,i+2\,u-1)\,c+a\,i\,(m-2\,k)}{2\,c},\,u;\right.$$

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

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

Involving powers of cos, powers of tanh and power

Involving $z^n \cos^m(a\,z) \tanh^u(c\,z) \operatorname{sech}(c\,z)$

01.23.21.0276.01

$$\int z^n \cos^m(a\,z) \tanh^u(c\,z) \operatorname{csch}(c\,z)\, dz = i^{u-1}\, 2^{1-m}\, e^{c\,u\,z} \binom{m}{\frac{m}{2}} \binom{u-1}{\frac{u-1}{2}} n!\, (1-m \bmod 2)$$
$$(1-(u-1) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j\,(c\,u)^{-j-1}\, z^{n-j}}{(n-j)!}\,_{j+2}F_{j+1}\left(\frac{u}{2}, \ldots, \frac{u}{2}, u; \frac{u}{2}+1, \ldots, \frac{u}{2}+1; -e^{2cz}\right) +$$
$$i^{u-1}\, 2^{1-m} \binom{u-1}{\frac{u-1}{2}} n!\, (1-(u-1) \bmod 2) \sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor} \binom{m}{k} \Bigg(e^{(c\,u-i\,a\,(m-2k))\,z} \sum_{j=0}^{n} \frac{(-1)^j\,(c\,u-i\,a\,(m-2k))^{-j-1}\, z^{n-j}}{(n-j)!}\,_{j+2}F_{j+1}$$
$$\left(\frac{c\,u-i\,a\,(m-2k)}{2c}, \ldots, \frac{c\,u-i\,a\,(m-2k)}{2c}, u; \frac{c\,u-i\,a\,(m-2k)}{2c}+1, \ldots, \frac{c\,u-i\,a\,(m-2k)}{2c}+1; -e^{2cz}\right) +$$
$$e^{(a\,i\,(m-2k)+c\,u)\,z} \sum_{j=0}^{n} \frac{(-1)^j\,(a\,i\,(m-2k)+c\,u)^{-j-1}\, z^{n-j}}{(n-j)!}\,_{j+2}F_{j+1}\left(\frac{a\,i\,(m-2k)+c\,u}{2c}, \ldots,\right.$$
$$\left.\frac{a\,i\,(m-2k)+c\,u}{2c}, u; \frac{a\,i\,(m-2k)+c\,u}{2c}+1, \ldots, \frac{a\,i\,(m-2k)+c\,u}{2c}+1; -e^{2cz}\right)\Bigg) +$$
$$2^{1-m}\, e^{c\,u\,z} \binom{m}{\frac{m}{2}} n!\, (1-m \bmod 2) \sum_{k=0}^{\left\lfloor\frac{u-2}{2}\right\rfloor} (-1)^k \binom{u-1}{k} \Bigg(e^{c\,(-2k+u-1)\,z} \sum_{j=0}^{n} \frac{(-1)^j\,(c\,(-2k+2u-1))^{-j-1}\, z^{n-j}}{(n-j)!}$$
$$\,_{j+2}F_{j+1}\left(\frac{1}{2}(-2k+2u-1), \ldots, \frac{1}{2}(-2k+2u-1), u; \frac{1}{2}(-2k+2u-1)+1, \ldots,\right.$$
$$\left.\frac{1}{2}(-2k+2u-1)+1; -e^{2cz}\right) + (-1)^{u-1}\, e^{-c\,(-2k+u-1)\,z} \sum_{j=0}^{n} \frac{(-1)^j\,(c\,(2k+1))^{-j-1}\, z^{n-j}}{(n-j)!}$$
$$\,_{j+2}F_{j+1}\left(\frac{1}{2}(2k+1), \ldots, \frac{1}{2}(2k+1), u; \frac{1}{2}(2k+1)+1, \ldots, \frac{1}{2}(2k+1)+1; -e^{2cz}\right)\Bigg) +$$
$$2^{1-m}\, e^{c\,u\,z}\, n! \sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor} \binom{m}{k} \sum_{i=0}^{\left\lfloor\frac{u-2}{2}\right\rfloor} (-1)^i \binom{u-1}{i} \Bigg(e^{(c\,(-2i+u-1)-i\,a\,(m-2k))\,z} \sum_{j=0}^{n} \frac{(-1)^j\,(c\,(-2i+2u-1)-i\,a\,(m-2k))^{-j-1}\, z^{n-j}}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\left(\frac{c\,(-2\,i+2\,u-1)-i\,a\,(m-2\,k)}{2\,c},\,\ldots,\,\frac{c\,(-2\,i+2\,u-1)-i\,a\,(m-2\,k)}{2\,c},\,u;\right.$$
$$\left.\frac{c\,(-2\,i+2\,u-1)-i\,a\,(m-2\,k)}{2\,c}+1,\,\ldots,\,\frac{c\,(-2\,i+2\,u-1)-i\,a\,(m-2\,k)}{2\,c}+1;\,-e^{2\,c\,z}\right)+$$
$$(-1)^{u-1}\,e^{(-i\,a\,(m-2\,k)-c\,(-2\,i+u-1))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(c\,(2\,i+1)-i\,a\,(m-2\,k))^{-j-1}\,z^{n-j}}{(n-j)!}$$
$$ {}_{j+2}F_{j+1}\left(\frac{c\,(2\,i+1)-i\,a\,(m-2\,k)}{2\,c},\,\ldots,\,\frac{c\,(2\,i+1)-i\,a\,(m-2\,k)}{2\,c},\,u;\right.$$
$$\left.\left.\frac{c\,(2\,i+1)-i\,a\,(m-2\,k)}{2\,c}+1,\,\ldots,\,\frac{c\,(2\,i+1)-i\,a\,(m-2\,k)}{2\,c}+1;\,-e^{2\,c\,z}\right)\right)+$$
$$2^{1-m}\,e^{c\,u\,z}\,n!\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\sum_{i=0}^{\left\lfloor\frac{u-2}{2}\right\rfloor}(-1)^i\binom{u-1}{i}\left(e^{(a\,i\,(m-2\,k)+c\,(-2\,i+u-1))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(a\,i\,(m-2\,k)+c\,(-2\,i+2\,u-1))^{-j-1}\,z^{n-j}}{(n-j)!}\right.$$
$$ {}_{j+2}F_{j+1}\left(\frac{(-2\,i+2\,u-1)\,c+a\,i\,(m-2\,k)}{2\,c},\,\ldots,\,\frac{(-2\,i+2\,u-1)\,c+a\,i\,(m-2\,k)}{2\,c},\,u;\right.$$
$$\left.\frac{(-2\,i+2\,u-1)\,c+a\,i\,(m-2\,k)}{2\,c}+1,\,\ldots,\,\frac{(-2\,i+2\,u-1)\,c+a\,i\,(m-2\,k)}{2\,c}+1;\,-e^{2\,c\,z}\right)+$$
$$(-1)^{u-1}\,e^{(i\,a\,(m-2\,k)-c\,(-2\,i+u-1))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(c\,(2\,i+1)+a\,i\,(m-2\,k))^{-j-1}\,z^{n-j}}{(n-j)!}$$
$$ {}_{j+2}F_{j+1}\left(\frac{(2\,i+1)\,c+a\,i\,(m-2\,k)}{2\,c},\,\ldots,\,\frac{(2\,i+1)\,c+a\,i\,(m-2\,k)}{2\,c},\,u;\,\frac{(2\,i+1)\,c+a\,i\,(m-2\,k)}{2\,c}+\right.$$
$$\left.\left.1,\,\ldots,\,\frac{(2\,i+1)\,c+a\,i\,(m-2\,k)}{2\,c}+1;\,-e^{2\,c\,z}\right)\right)/;\,n\in\mathbb{N}\bigwedge m\in\mathbb{N}^+\bigwedge u\in\mathbb{N}^+$$

Involving sin, coth and power

Involving $z^n\sin(a\,z)\coth(c\,z)\operatorname{csch}(c\,z)$

01.23.21.0277.01

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

Involving powers of sin, powers of coth and power

Involving $z^n \sin^m(a z) \coth^u(c z) \operatorname{csch}(c z)$

01.23.21.0278.01

$$\int z^n \sin^m(a z) \coth^u(c z) \operatorname{csch}(c z)\, dz = 2^{-m-u} \left(1-e^{2cz}\right)^{u+1} \binom{m}{\frac{m}{2}} n! \, (1 - m \bmod 2) \left(\left(\binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (c(u+1))^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{u+1}{2}, \ldots, \frac{u+1}{2}, u+1; \frac{u+1}{2}+1, \ldots, \frac{u+1}{2}+1; e^{2cz}\right) + \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(e^{-c(u-2s) z} \sum_{j=0}^{n} \frac{(-1)^j (c(2s+1))^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{1}{2}(2s+1), \ldots, \frac{1}{2}(2s+1), u+1; \frac{1}{2}(2s+1)+1, \ldots, \frac{1}{2}(2s+1)+1; e^{2cz}\right) + e^{c(u-2s) z} \sum_{j=0}^{n} \frac{(-1)^j (c(-2s+2u+1))^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{1}{2}(-2s+2u+1), \ldots, \frac{1}{2}(-2s+2u+1), u+1; \frac{1}{2}(-2s+2u+1)+1, \ldots, \frac{1}{2}(-2s+2u+1)+1; e^{2cz}\right)\right)\right)\right) \operatorname{csch}^{u+1}(c z) +$$

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

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

$$_{j+2}F_{j+1}\left(\frac{c(2s+1)-i a(m-2k)}{2c}, \ldots, \frac{c(2s+1)-i a(m-2k)}{2c}, u+1;\right.$$

$$\left.\frac{c(2s+1)-i a(m-2k)}{2c}+1, \ldots, \frac{c(2s+1)-i a(m-2k)}{2c}+1; e^{2cz}\right)+$$

$$e^{(c(u-2s)-i a(m-2k))z}\sum_{j=0}^{n}\frac{(-1)^j (c(-2s+2u+1)-i a(m-2k))^{-j-1} z^{n-j}}{(n-j)!}$$

$$_{j+2}F_{j+1}\left(\frac{c(-2s+2u+1)-i a(m-2k)}{2c}, \ldots, \frac{c(-2s+2u+1)-i a(m-2k)}{2c}, u+1;\right.$$

$$\left.\left.\left.\frac{c(-2s+2u+1)-i a(m-2k)}{2c}+1, \ldots, \frac{c(-2s+2u+1)-i a(m-2k)}{2c}+1; e^{2cz}\right)\right)\right)+$$

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

$$\left(\frac{i a(m-2k)+c(u+1)}{2c}, \ldots, \frac{i a(m-2k)+c(u+1)}{2c}, u+1;\right.$$

$$\left.\frac{i a(m-2k)+c(u+1)}{2c}+1, \ldots, \frac{i a(m-2k)+c(u+1)}{2c}+1; e^{2cz}\right)+$$

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

$$_{j+2}F_{j+1}\left(\frac{i a(m-2k)+c(2s+1)}{2c}, \ldots, \frac{i a(m-2k)+c(2s+1)}{2c}, u+1;\right.$$

$$\left.\frac{i a(m-2k)+c(2s+1)}{2c}+1, \ldots, \frac{i a(m-2k)+c(2s+1)}{2c}+1; e^{2cz}\right)+$$

$$e^{(a i (m-2k)+c(u-2s))z}\sum_{j=0}^{n}\frac{(-1)^j (a i (m-2k)+c(-2s+2u+1))^{-j-1} z^{n-j}}{(n-j)!}$$

$$_{j+2}F_{j+1}\left(\frac{i a(m-2k)+c(-2s+2u+1)}{2c}, \ldots, \frac{i a(m-2k)+c(-2s+2u+1)}{2c}, u+1;\right.$$

$$\frac{i a(m-2k)+c(-2s+2u+1)}{2c}+1, \ldots, \frac{i a(m-2k)+c(-2s+2u+1)}{2c}+1;$$

$$\left.\left.\left.\left.\left.e^{2cz}\right)\right)\right)\right)\right)\operatorname{csch}^{u+1}(cz)\ /;\ n\in\mathbb{N}\land m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

Involving cos, coth and power

Involving $z^n \cos(a z) \coth(c z) \operatorname{csch}(c z)$

01.23.21.0279.01

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

Involving powers of cos, powers of coth and power

Involving $z^n \cos^m(a z) \coth^u(c z) \operatorname{csch}(c z)$

01.23.21.0280.01

$$\int z^n \cos^m(a z) \coth^u(c z) \operatorname{csch}(c z)\, dz = -2^{-m-u+1} e^{c z} \left(1 - e^{2 c z}\right)^u \binom{m}{\frac{m}{2}} n! \,(1 - m \bmod 2) \left(\binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c (u+1))^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{u+1}{2}, \ldots, \frac{u+1}{2}, u+1; \frac{u+1}{2} + 1, \ldots, \frac{u+1}{2} + 1; e^{2 c z} \right) + \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(e^{-c (u - 2 s) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c (2 s + 1))^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{1}{2} (2 s + 1), \ldots, \frac{1}{2} (2 s + 1), u + 1; \frac{1}{2} (2 s + 1) + 1, \ldots, \frac{1}{2} (2 s + 1) + 1; e^{2 c z} \right) + e^{c (u - 2 s) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c (-2 s + 2 u + 1))^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{1}{2} (-2 s + 2 u + 1), \ldots, \frac{1}{2} (-2 s + 2 u + 1), u + 1; \frac{1}{2} (-2 s + 2 u + 1) + 1, \ldots, \frac{1}{2} (-2 s + 2 u + 1) + 1; e^{2 c z} \right) \right) \right) \operatorname{csch}^u(c z) - 2^{-m-u+1} n! \, e^{c z} \left(1 - e^{2 c z}\right)^u \left(\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left(e^{-i a (m - 2 k) z} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c (u+1) - i a (m - 2 k))^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c (u+1) - i a (m - 2 k)}{2 c}, \ldots, \frac{c (u+1) - i a (m - 2 k)}{2 c}, u + 1; \frac{c (u+1) - i a (m - 2 k)}{2 c} + 1, \ldots, \frac{c (u+1) - i a (m - 2 k)}{2 c} + 1; e^{2 c z} \right) + \right.\right.$$

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

$$\sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(e^{(-i a (m-2k) - c(u-2s)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c(2s+1) - i a (m-2k))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c(2s+1) - i a (m-2k)}{2c}, \ldots, \frac{c(2s+1) - i a (m-2k)}{2c}, u+1; \frac{c(2s+1) - i a (m-2k)}{2c} + 1, \ldots, \frac{c(2s+1) - i a (m-2k)}{2c} + 1; e^{2cz}\right) + e^{(c(u-2s) - i a (m-2k)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c(-2s+2u+1) - i a (m-2k))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c(-2s+2u+1) - i a (m-2k)}{2c}, \ldots, \frac{c(-2s+2u+1) - i a (m-2k)}{2c}, u+1; \frac{c(-2s+2u+1) - i a (m-2k)}{2c} + 1, \ldots, \frac{c(-2s+2u+1) - i a (m-2k)}{2c} + 1; e^{2cz}\right)\right) +$$

$$\sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(e^{(i a (m-2k) - c(u-2s)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} ((2s+1) c + a i (m-2k))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a (m-2k) + c(2s+1)}{2c}, \ldots, \frac{i a (m-2k) + c(2s+1)}{2c}, u+1; \frac{i a (m-2k) + c(2s+1)}{2c} + 1, \ldots, \frac{i a (m-2k) + c(2s+1)}{2c} + 1; e^{2cz}\right) + e^{(a i (m-2k) + c(u-2s)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} ((-2s+2u+1) c + a i (m-2k))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a (m-2k) + c(-2s+2u+1)}{2c}, \ldots, \frac{i a (m-2k) + c(-2s+2u+1)}{2c}, u+1; \frac{i a (m-2k) + c(-2s+2u+1)}{2c} + 1, \ldots, \frac{i a (m-2k) + c(-2s+2u+1)}{2c} + 1; e^{2cz}\right)\right)\Bigg)\Bigg) \operatorname{csch}^u(cz) /; n \in \mathbb{N} \wedge m \in \mathbb{N}^+ \wedge u \in \mathbb{N}^+$$

Involving hyperbolic, exponential, trigonometric and a power functions

Involving sin, sinh, exp and power

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

01.23.21.0281.01

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

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

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

01.23.21.0282.01

$$\int z^n e^{p z} \sin^m(a z) \sinh^u(b z) \operatorname{csch}(c z) \, dz = -i^u 2^{-m-u+1} e^{(c+p) z} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! (1-m \bmod 2)(1-u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (c+p)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c+p}{2 c}, \ldots, \frac{c+p}{2 c}, 1; \frac{c+p}{2 c}+1, \ldots, \frac{c+p}{2 c}+1; e^{2 c z} \right) - i^u 2^{-m-u+1} \binom{u}{\frac{u}{2}} n! (1-u \bmod 2) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left(e^{\frac{i \pi m}{2}+(c-i a (m-2 k)+p) z} \sum_{j=0}^{n} \frac{(-1)^j (c-i a (m-2 k)+p)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c-i a (m-2 k)+p}{2 c}, \ldots, \frac{c-i a (m-2 k)+p}{2 c}, 1; \frac{c-i a (m-2 k)+p}{2 c}+1, \ldots, \frac{c-i a (m-2 k)+p}{2 c}+1; e^{2 c z} \right) + e^{(c+a i (m-2 k)+p) z-\frac{i m \pi}{2}} \sum_{j=0}^{n} \frac{(-1)^j (c+a i (m-2 k)+p)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c+i a (m-2 k)+p}{2 c}, \ldots, \frac{c+i a (m-2 k)+p}{2 c}, 1; \frac{c+i a (m-2 k)+p}{2 c}+1, \ldots, \frac{c+i a (m-2 k)+p}{2 c}+1; e^{2 c z} \right) \right) - i^u 2^{-m-u+1} \binom{m}{\frac{m}{2}} n! (1-m \bmod 2) \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^s \binom{u}{s} \left(e^{\frac{i \pi u}{2}+(c+p-b (u-2 s)) z} \sum_{j=0}^{n} \frac{(-1)^j (c+p-b (u-2 s))^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1} \right.$$

$$\left(\frac{c+p-b(u-2s)}{2c}, \ldots, \frac{c+p-b(u-2s)}{2c}, 1; \frac{c+p-b(u-2s)}{2c}+1, \ldots, \frac{c+p-b(u-2s)}{2c}+1; e^{2cz}\right)+$$

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

$$\left.\left.\frac{c+p+b(u-2s)}{2c}, 1; \frac{c+p+b(u-2s)}{2c}+1, \ldots, \frac{c+p+b(u-2s)}{2c}+1; e^{2cz}\right)\right) - i^u 2^{-m-u+1} n!$$

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

$${}_{j+2}F_{j+1}\left(\frac{c-i a(m-2k)+p-b(u-2s)}{2c}, \ldots, \frac{c-i a(m-2k)+p-b(u-2s)}{2c}, 1;\right.$$

$$\left.\frac{c-i a(m-2k)+p-b(u-2s)}{2c}+1, \ldots, \frac{c-i a(m-2k)+p-b(u-2s)}{2c}+1; e^{2cz}\right)+$$

$$e^{-\frac{1}{2} i\pi m+\frac{i\pi u}{2}+(c+a i(m-2k)+p-b(u-2s))z} \sum_{j=0}^{n} \frac{(-1)^j (c+a i(m-2k)+p-b(u-2s))^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c+i a(m-2k)+p-b(u-2s)}{2c}, \ldots, \frac{c+i a(m-2k)+p-b(u-2s)}{2c}, 1;\right.$$

$$\left.\frac{c+i a(m-2k)+p-b(u-2s)}{2c}+1, \ldots, \frac{c+i a(m-2k)+p-b(u-2s)}{2c}+1; e^{2cz}\right)+$$

$$e^{\frac{i\pi m}{2}+(c-i a(m-2k)+p+b(u-2s))z-\frac{i\pi u}{2}} \sum_{j=0}^{n} \frac{(-1)^j (c-i a(m-2k)+p+b(u-2s))^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c-i a(m-2k)+p+b(u-2s)}{2c}, \ldots, \frac{c-i a(m-2k)+p+b(u-2s)}{2c}, 1;\right.$$

$$\left.\frac{c-i a(m-2k)+p+b(u-2s)}{2c}+1, \ldots, \frac{c-i a(m-2k)+p+b(u-2s)}{2c}+1; e^{2cz}\right)+$$

$$e^{-\frac{1}{2} i\pi m+(c+a i(m-2k)+p+b(u-2s))z-\frac{i\pi u}{2}} \sum_{j=0}^{n} \frac{(-1)^j (c+a i(m-2k)+p+b(u-2s))^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c+i a(m-2k)+p+b(u-2s)}{2c}, \ldots,\right.$$

$$\frac{c+i a(m-2k)+p+b(u-2s)}{2c}, 1; \frac{c+i a(m-2k)+p+b(u-2s)}{2c}+$$

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

Involving cos, sinh, exp and power

Involving $z^n e^{pz} \cos(az) \sinh(bz) \operatorname{csch}(cz)$

01.23.21.0283.01

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

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

Involving $z^n e^{pz}\cos^m(az)\sinh^u(bz)\operatorname{csch}(cz)$

01.23.21.0284.01

$$\int z^n e^{pz}\cos^m(az)\sinh^u(bz)\operatorname{csch}(cz)\,dz = -i^u\,2^{-m-u+1}e^{(c+p)z}\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}n!\,(1-m\bmod 2)(1-u\bmod 2)\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p+c)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{c+p}{2c},\ldots,\frac{c+p}{2c},1;\frac{c+p}{2c}+1,\ldots,\frac{c+p}{2c}+1;e^{2cz}\right)+i^u\,2^{-m-u+1}e^{cz}\binom{u}{\frac{u}{2}}n!\,(u\bmod 2-1)\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(e^{(p+ai(m-2s))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p+ai(m-2s)+c)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{p+ai(m-2s)+c}{2c},\ldots,\frac{p+ai(m-2s)+c}{2c},1;\frac{p+ai(m-2s)+c}{2c}+1,\ldots,\frac{p+ai(m-2s)+c}{2c}+1;e^{2cz}\right)+e^{(p-ia(m-2s))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p-ia(m-2s)+c)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{p-ia(m-2s)+c}{2c},\ldots,\frac{p-ia(m-2s)+c}{2c},1;\frac{p-ia(m-2s)+c}{2c}+1,\ldots,\frac{p-ia(m-2s)+c}{2c}+1;e^{2cz}\right)\right)+2^{-m-u+1}e^{cz}\binom{m}{\frac{m}{2}}n!\,(m\bmod 2-1)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\left(e^{(p+b(u-2k))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p+b(u-2k)+c)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\right.$$

$$\left(\frac{p+b(u-2k)+c}{2c}, \ldots, \frac{p+b(u-2k)+c}{2c}, 1; \frac{p+b(u-2k)+c}{2c}+1, \ldots, \frac{p+b(u-2k)+c}{2c}+1; e^{2cz}\right)+$$

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

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

$$2^{1-m-u} e^{cz} n! \sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor} \sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor} (-1)^k \binom{m}{s}\binom{u}{k} \left(e^{(p-i a(m-2s)+b(u-2k))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p-i a(m-2s)+b(-2k+u)+c)^{-j-1}}{(n-j)!}\right.$$

$$ {}_{j+2}F_{j+1}\left(\frac{p-i a(m-2s)+b(-2k+u)+c}{2c}, \ldots, \frac{p-i a(m-2s)+b(-2k+u)+c}{2c}, 1;\right.$$

$$\left.\frac{p-i a(m-2s)+b(-2k+u)+c}{2c}+1, \ldots, \frac{p-i a(m-2s)+b(-2k+u)+c}{2c}+1; e^{2cz}\right)+$$

$$(-1)^u e^{(p+a i(m-2s)-b(u-2k))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+i a(m-2s)-b(-2k+u)+c)^{-j-1}}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\left(\frac{p+i a(m-2s)-b(-2k+u)+c}{2c}, \ldots, \frac{p+i a(m-2s)-b(-2k+u)+c}{2c}, 1;\right.$$

$$\left.\frac{p+i a(m-2s)-b(-2k+u)+c}{2c}+1, \ldots, \frac{p+i a(m-2s)-b(-2k+u)+c}{2c}+1; e^{2cz}\right)+$$

$$(-1)^u e^{(p-i a(m-2s)-b(u-2k))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p-i a(m-2s)-b(-2k+u)+c)^{-j-1}}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\left(\frac{p-i a(m-2s)-b(-2k+u)+c}{2c}, \ldots, \frac{p-i a(m-2s)-b(-2k+u)+c}{2c}, 1;\right.$$

$$\left.\frac{p-i a(m-2s)-b(-2k+u)+c}{2c}+1, \ldots, \frac{p-i a(m-2s)-b(-2k+u)+c}{2c}+1; e^{2cz}\right)+$$

$$e^{(p+a i(m-2s)+b(u-2k))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+i a(m-2s)+b(-2k+u)+c)^{-j-1}}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\left(\frac{p+i a(m-2s)+b(-2k+u)+c}{2c}, \ldots, \frac{p+i a(m-2s)+b(-2k+u)+c}{2c},\right.$$

$$1; \frac{p+i a(m-2s)+b(-2k+u)+c}{2c}+1, \ldots,$$

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

Involving sin, cosh, exp and power

Involving $z^n e^{pz} \sin(az) \cosh(bz) \operatorname{csch}(cz)$

01.23.21.0285.01

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

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

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

01.23.21.0286.01

$$\int z^n e^{p z} \sin^m(a z) \cosh^u(b z) \operatorname{csch}(c z) \, dz = -2^{-m-u+1} e^{(c+p) z} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! \, (1 - m \bmod 2) (1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (c+p)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c+p}{2 c}, \ldots, \frac{c+p}{2 c}, 1; \frac{c+p}{2 c}+1, \ldots, \frac{c+p}{2 c}+1; e^{2 c z}\right) + 2^{-m-u} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left(-2 e^{\frac{i \pi m}{2} + (c - i a (m-2k) + p) z} n! \sum_{j=0}^{n} \frac{(-1)^j (c - i a (m-2k) + p)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c - i a (m-2k) + p}{2 c}, \ldots, \frac{c - i a (m-2k) + p}{2 c}, 1; \frac{c - i a (m-2k) + p}{2 c}+1, \ldots, \frac{c - i a (m-2k) + p}{2 c}+1; e^{2 c z}\right) - 2 e^{(c + a i (m-2k) + p) z - \frac{i m \pi}{2}} n! \sum_{j=0}^{n} \frac{(-1)^j (c + a i (m-2k) + p)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c + i a (m-2k) + p}{2 c}, \ldots, \frac{c + i a (m-2k) + p}{2 c}, 1; \frac{c + i a (m-2k) + p}{2 c}+1, \ldots, \frac{c + i a (m-2k) + p}{2 c}+1; e^{2 c z}\right)\right) + 2^{-m-u} \binom{m}{\frac{m}{2}} (1 - m \bmod 2) \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(-2 e^{(c+p-b(u-2s)) z} n! \sum_{j=0}^{n} \frac{(-1)^j (c+p-b(u-2s))^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\right.$$

$$\left(\frac{c+p-b(u-2s)}{2c}, \ldots, \frac{c+p-b(u-2s)}{2c}, 1; \frac{c+p-b(u-2s)}{2c}+1, \ldots, \frac{c+p-b(u-2s)}{2c}+1; e^{2cz}\right) -$$

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

$$\left.\left.\frac{c+p+b(u-2s)}{2c}, 1; \frac{c+p+b(u-2s)}{2c}+1, \ldots, \frac{c+p+b(u-2s)}{2c}+1; e^{2cz}\right)\right) +$$

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

$${}_{j+2}F_{j+1}\left(\frac{c-i a(m-2k)+p-b(u-2s)}{2c}, \ldots, \frac{c-i a(m-2k)+p-b(u-2s)}{2c}, 1;\right.$$

$$\left.\frac{c-i a(m-2k)+p-b(u-2s)}{2c}+1, \ldots, \frac{c-i a(m-2k)+p-b(u-2s)}{2c}+1; e^{2cz}\right) -$$

$$2\, e^{(c+a i(m-2k)+p-b(u-2s))z-\frac{i m\pi}{2}}\, n! \sum_{j=0}^{n} \frac{(-1)^j (c+a i(m-2k)+p-b(u-2s))^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c+i a(m-2k)+p-b(u-2s)}{2c}, \ldots, \frac{c+i a(m-2k)+p-b(u-2s)}{2c}, 1;\right.$$

$$\left.\frac{c+i a(m-2k)+p-b(u-2s)}{2c}+1, \ldots, \frac{c+i a(m-2k)+p-b(u-2s)}{2c}+1; e^{2cz}\right) -$$

$$2\, e^{\frac{i\pi m}{2}+(c-i a(m-2k)+p+b(u-2s))z}\, n! \sum_{j=0}^{n} \frac{(-1)^j (c-i a(m-2k)+p+b(u-2s))^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c-i a(m-2k)+p+b(u-2s)}{2c}, \ldots, \frac{c-i a(m-2k)+p+b(u-2s)}{2c}, 1;\right.$$

$$\left.\frac{c-i a(m-2k)+p+b(u-2s)}{2c}+1, \ldots, \frac{c-i a(m-2k)+p+b(u-2s)}{2c}+1; e^{2cz}\right) -$$

$$2\, e^{(c+a i(m-2k)+p+b(u-2s))z-\frac{i m\pi}{2}}\, n! \sum_{j=0}^{n} \frac{(-1)^j (c+a i(m-2k)+p+b(u-2s))^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c+i a(m-2k)+p+b(u-2s)}{2c}, \ldots,\right.$$

$$\frac{c+i a(m-2k)+p+b(u-2s)}{2c}, 1; \frac{c+i a(m-2k)+p+b(u-2s)}{2c}+$$

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

Involving cos, cosh, exp and power

Involving $z^n e^{pz} \cos(az) \cosh(bz) \operatorname{csch}(cz)$

01.23.21.0287.01

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

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

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

01.23.21.0288.01

$$\int z^n e^{p z} \cos^m(a z) \cosh^u(b z) \operatorname{csch}(c z) \, dz = -2^{-m-u+1} e^{(c+p) z} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n! \, (1 - m \bmod 2) (1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (c+p)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c+p}{2 c}, \ldots, \frac{c+p}{2 c}, 1; \frac{c+p}{2 c} + 1, \ldots, \frac{c+p}{2 c} + 1; e^{2 c z} \right) - 2^{-m-u+1} \binom{u}{\frac{u}{2}} n! \, (1 - u \bmod 2) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left(e^{(c - i a (m - 2 k) + p) z} \sum_{j=0}^{n} \frac{(-1)^j (c - i a (m - 2 k) + p)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c - i a (m - 2 k) + p}{2 c}, \ldots, \frac{c - i a (m - 2 k) + p}{2 c}, 1; \frac{c - i a (m - 2 k) + p}{2 c} + 1, \ldots, \frac{c - i a (m - 2 k) + p}{2 c} + 1; e^{2 c z} \right) + e^{(c + a i (m - 2 k) + p) z} \sum_{j=0}^{n} \frac{(-1)^j (c + a i (m - 2 k) + p)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c + i a (m - 2 k) + p}{2 c}, \ldots, \frac{c + i a (m - 2 k) + p}{2 c}, 1; \frac{c + i a (m - 2 k) + p}{2 c} + 1, \ldots, \frac{c + i a (m - 2 k) + p}{2 c} + 1; e^{2 c z} \right) \right) - 2^{-m-u+1} \binom{m}{\frac{m}{2}} n! \, (1 - m \bmod 2) \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(e^{(c + p - b (u - 2 s)) z} \sum_{j=0}^{n} \frac{(-1)^j (c + p - b (u - 2 s))^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1} \right.$$

$$\left(\frac{c+p-b(u-2s)}{2c}, \ldots, \frac{c+p-b(u-2s)}{2c}, 1; \frac{c+p-b(u-2s)}{2c}+1, \ldots, \frac{c+p-b(u-2s)}{2c}+1; e^{2cz}\right)+$$

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

$$\left.\left.\frac{c+p+b(u-2s)}{2c}, 1; \frac{c+p+b(u-2s)}{2c}+1, \ldots, \frac{c+p+b(u-2s)}{2c}+1; e^{2cz}\right)\right)-$$

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

$${}_{j+2}F_{j+1}\left(\frac{c-i a(m-2k)+p-b(u-2s)}{2c}, \ldots, \frac{c-i a(m-2k)+p-b(u-2s)}{2c}, 1;\right.$$

$$\left.\frac{c-i a(m-2k)+p-b(u-2s)}{2c}+1, \ldots, \frac{c-i a(m-2k)+p-b(u-2s)}{2c}+1; e^{2cz}\right)+$$

$$e^{(c+a i(m-2k)+p-b(u-2s))z} \sum_{j=0}^{n} \frac{(-1)^j (c+a i(m-2k)+p-b(u-2s))^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c+i a(m-2k)+p-b(u-2s)}{2c}, \ldots, \frac{c+i a(m-2k)+p-b(u-2s)}{2c}, 1;\right.$$

$$\left.\frac{c+i a(m-2k)+p-b(u-2s)}{2c}+1, \ldots, \frac{c+i a(m-2k)+p-b(u-2s)}{2c}+1; e^{2cz}\right)+$$

$$e^{(c-i a(m-2k)+p+b(u-2s))z} \sum_{j=0}^{n} \frac{(-1)^j (c-i a(m-2k)+p+b(u-2s))^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c-i a(m-2k)+p+b(u-2s)}{2c}, \ldots, \frac{c-i a(m-2k)+p+b(u-2s)}{2c}, 1;\right.$$

$$\left.\frac{c-i a(m-2k)+p+b(u-2s)}{2c}+1, \ldots, \frac{c-i a(m-2k)+p+b(u-2s)}{2c}+1; e^{2cz}\right)+$$

$$e^{(c+a i(m-2k)+p+b(u-2s))z} \sum_{j=0}^{n} \frac{(-1)^j (c+a i(m-2k)+p+b(u-2s))^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c+i a(m-2k)+p+b(u-2s)}{2c}, \ldots,\right.$$

$$\frac{c+i a(m-2k)+p+b(u-2s)}{2c}, 1; \frac{c+i a(m-2k)+p+b(u-2s)}{2c}+$$

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

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

Involving $z^n e^{pz} \sin^m(az) \tanh^u(cz) \operatorname{csch}(cz)$

01.23.21.0289.01

$$\int z^n e^{pz} \sin^m(az) \tanh^u(cz) \operatorname{csch}(cz)\, dz = i^{u-1} 2^{1-m} e^{(p+cu)z} \binom{m}{\frac{m}{2}} \binom{u-1}{\frac{u-1}{2}} n!\, (1 - m \bmod 2)\, (1 - (u-1) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (p+cu)^{-j-1} z^{n-j}}{(n-j)!}$$

$$_{j+2}F_{j+1}\left(\frac{p+cu}{2c}, \ldots, \frac{p+cu}{2c}, u; \frac{p+cu}{2c}+1, \ldots, \frac{p+cu}{2c}+1; -e^{2cz}\right) + i^{u-1} 2^{1-m} \binom{u-1}{\frac{u-1}{2}} n!\, (1-(u-1) \bmod 2)$$

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

$$\left. \ldots, \frac{-ia(m-2k)+p+cu}{2c}, u; \frac{-ia(m-2k)+p+cu}{2c}+1, \ldots, \frac{-ia(m-2k)+p+cu}{2c}+1; -e^{2cz}\right) +$$

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

$$\left.\left. \frac{ia(m-2k)+p+cu}{2c}, u; \frac{ia(m-2k)+p+cu}{2c}+1, \ldots, \frac{ia(m-2k)+p+cu}{2c}+1; -e^{2cz}\right)\right) +$$

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

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

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

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

$$2^{1-m} e^{\frac{i\pi m}{2} + cuz} n! \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \sum_{i=0}^{\left\lfloor \frac{u-2}{2} \right\rfloor} (-1)^i \binom{u-1}{i} \left((-1)^{u-1} e^{(-ia(m-2k)+p-c(-2i+u-1))z} \right.$$

$$\sum_{j=0}^{n} \frac{(-1)^j (c(2i+1) - ia(m-2k)+p)^{-j-1} z^{n-j}}{(n-j)!}$$

$$_{j+2}F_{j+1}\left(\frac{c(2i+1)-ia(m-2k)+p}{2c}, \ldots, \frac{c(2i+1)-ia(m-2k)+p}{2c}, u; \right.$$

$$\left. \frac{c(2i+1)-ia(m-2k)+p}{2c}+1, \ldots, \frac{c(2i+1)-ia(m-2k)+p}{2c}+1; -e^{2cz}\right) +$$

$$e^{(-ia(m-2k)+p+c(-2i+u-1))z} \sum_{j=0}^{n} \frac{(-1)^j (-ia(m-2k)+p+c(-2i+2u-1))^{-j-1} z^{n-j}}{(n-j)!}$$

$$_{j+2}F_{j+1}\left(\frac{-ia(m-2k)+p+c(-2i+2u-1)}{2c}, \ldots, \frac{-ia(m-2k)+p+c(-2i+2u-1)}{2c}, u; \right.$$

$$\frac{-i\,a\,(m-2\,k)+p+c\,(-2\,i+2\,u-1)}{2\,c}+1,\,\ldots,\,\frac{-i\,a\,(m-2\,k)+p+c\,(-2\,i+2\,u-1)}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)\Bigg)+$$

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

$$\sum_{j=0}^{n}\frac{(-1)^j\,(c\,(2\,i+1)+a\,i\,(m-2\,k)+p)^{-j-1}\,z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}$$

$$\Bigg(\frac{c\,(2\,i+1)+i\,a\,(m-2\,k)+p}{2\,c},\,\ldots,\,\frac{c\,(2\,i+1)+i\,a\,(m-2\,k)+p}{2\,c},\,u;\,\frac{c\,(2\,i+1)+i\,a\,(m-2\,k)+p}{2\,c}+$$

$$1,\,\ldots,\,\frac{c\,(2\,i+1)+i\,a\,(m-2\,k)+p}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+e^{(a\,i\,(m-2\,k)+p+c\,(-2\,i+u-1))\,z}$$

$$\sum_{j=0}^{n}\frac{(-1)^j\,(a\,i\,(m-2\,k)+p+c\,(-2\,i+2\,u-1))^{-j-1}\,z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}\Bigg(\frac{i\,a\,(m-2\,k)+p+c\,(-2\,i+2\,u-1)}{2\,c},$$

$$\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(-2\,i+2\,u-1)}{2\,c},\,u;\,\frac{i\,a\,(m-2\,k)+p+c\,(-2\,i+2\,u-1)}{2\,c}+$$

$$1,\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(-2\,i+2\,u-1)}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)\Bigg)\,/;\,n\in\mathbb{N}\bigwedge m\in\mathbb{N}^+\bigwedge u\in\mathbb{N}^+$$

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

Involving $z^n\,e^{p\,z}\cos^m(a\,z)\tanh^u(c\,z)\,\mathrm{sech}(c\,z)$

01.23.21.0290.01

$$\int z^n\,e^{p\,z}\cos^m(a\,z)\tanh^u(c\,z)\,\mathrm{csch}(c\,z)\,dz=$$

$$i^{u-1}\,2^{1-m}\,e^{(p+c\,u)\,z}\binom{m}{\frac{m}{2}}\binom{u-1}{\frac{u-1}{2}}n!\,(1-m\bmod 2)\,(1-(u-1)\bmod 2)\sum_{j=0}^{n}\frac{(-1)^j\,(p+c\,u)^{-j-1}\,z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{p+c\,u}{2\,c},\,\ldots,\,\frac{p+c\,u}{2\,c},\,u;\,\frac{p+c\,u}{2\,c}+1,\,\ldots,\,\frac{p+c\,u}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+i^{u-1}\,2^{1-m}\binom{u-1}{\frac{u-1}{2}}n!\,(1-(u-1)\bmod 2)$$

$$\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\Bigg(e^{(-i\,a\,(m-2\,k)+p+c\,u)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(-i\,a\,(m-2\,k)+p+c\,u)^{-j-1}\,z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}\Bigg(\frac{-i\,a\,(m-2\,k)+p+c\,u}{2\,c},\,\ldots,$$

$$\frac{-i\,a\,(m-2\,k)+p+c\,u}{2\,c},\,u;\,\frac{-i\,a\,(m-2\,k)+p+c\,u}{2\,c}+1,\,\ldots,\,\frac{-i\,a\,(m-2\,k)+p+c\,u}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+$$

$$e^{(a\,i\,(m-2\,k)+p+c\,u)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(a\,i\,(m-2\,k)+p+c\,u)^{-j-1}\,z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}\Bigg(\frac{i\,a\,(m-2\,k)+p+c\,u}{2\,c},\,\ldots,$$

$$\frac{i\,a\,(m-2\,k)+p+c\,u}{2\,c},\,u;\,\frac{i\,a\,(m-2\,k)+p+c\,u}{2\,c}+1,\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,u}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)\Bigg)+$$

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

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

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

$$\frac{p+c(-2k+2u-1)}{2c}, u; \frac{p+c(-2k+2u-1)}{2c} + 1, \ldots, \frac{p+c(-2k+2u-1)}{2c} + 1; -e^{2cz} \Bigg) \Bigg) + 2^{1-m}$$

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

$$ {}_{j+2}F_{j+1}\Bigg(\frac{c(2i+1) - i a (m-2k) + p}{2c}, \ldots, \frac{c(2i+1) - i a (m-2k) + p}{2c}, u;$$

$$\frac{c(2i+1) - i a (m-2k) + p}{2c} + 1, \ldots, \frac{c(2i+1) - i a (m-2k) + p}{2c} + 1; -e^{2cz} \Bigg) +$$

$$e^{(-i a (m-2k) + p + c(-2i+u-1)) z} \sum_{j=0}^{n} \frac{(-1)^j (-i a (m-2k) + p + c(-2i+2u-1))^{-j-1} z^{n-j}}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\Bigg(\frac{-i a (m-2k) + p + c(-2i+2u-1)}{2c}, \ldots, \frac{-i a (m-2k) + p + c(-2i+2u-1)}{2c}, u;$$

$$\frac{-i a (m-2k) + p + c(-2i+2u-1)}{2c} + 1, \ldots, \frac{-i a (m-2k) + p + c(-2i+2u-1)}{2c} + 1; -e^{2cz} \Bigg) \Bigg) +$$

$$2^{1-m} e^{c u z} n! \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \sum_{i=0}^{\left\lfloor \frac{u-2}{2} \right\rfloor} (-1)^i \binom{u-1}{i} \Bigg((-1)^{u-1} e^{(a i (m-2k) + p - c(-2i+u-1)) z}$$

$$\sum_{j=0}^{n} \frac{(-1)^j (c(2i+1) + a i (m-2k) + p)^{-j-1} z^{n-j}}{(n-j)!} \; {}_{j+2}F_{j+1}$$

$$\Bigg(\frac{c(2i+1) + i a (m-2k) + p}{2c}, \ldots, \frac{c(2i+1) + i a (m-2k) + p}{2c}, u; \frac{c(2i+1) + i a (m-2k) + p}{2c} +$$

$$1, \ldots, \frac{c(2i+1) + i a (m-2k) + p}{2c} + 1; -e^{2cz} \Bigg) + e^{(a i (m-2k) + p + c(-2i+u-1)) z}$$

$$\sum_{j=0}^{n} \frac{(-1)^j (a i (m-2k) + p + c(-2i+2u-1))^{-j-1} z^{n-j}}{(n-j)!} \; {}_{j+2}F_{j+1}\Bigg(\frac{i a (m-2k) + p + c(-2i+2u-1)}{2c},$$

$$\ldots, \frac{i a (m-2k) + p + c(-2i+2u-1)}{2c}, u; \frac{i a (m-2k) + p + c(-2i+2u-1)}{2c} +$$

$$1, \ldots, \frac{i a (m-2k) + p + c(-2i+2u-1)}{2c} + 1; -e^{2cz} \Bigg) \Bigg) /; n \in \mathbb{N} \bigwedge m \in \mathbb{N}^+ \bigwedge u \in \mathbb{N}^+$$

Involving sin, coth, exp and power

Involving $z^n e^{pz} \sin(az) \coth(cz) \operatorname{csch}(cz)$

01.23.21.0291.01

$$\int z^n e^{pz} \sin(az) \coth(cz) \operatorname{csch}(cz)\, dz = i\, e^{2cz}\, n! \Bigg(e^{(-c-ia+p)z} \sum_{j=0}^{n} \frac{(-1)^j (c-ia+p)^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\Big(\frac{-ia+c+p}{2c}, \ldots, \frac{-ia+c+p}{2c}, 2; \frac{-ia+c+p}{2c}+1, \ldots, \frac{-ia+c+p}{2c}+1; e^{2cz}\Big) - e^{(-c+ia+p)z} \sum_{j=0}^{n} \frac{(-1)^j (c+ia+p)^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\Big(\frac{ia+c+p}{2c}, \ldots, \frac{ia+c+p}{2c}, 2; \frac{ia+c+p}{2c}+1, \ldots, \frac{ia+c+p}{2c}+1; e^{2cz}\Big) + e^{(c-ia+p)z} \sum_{j=0}^{n} \frac{(-1)^j (3c-ia+p)^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\Big(\frac{-ia+3c+p}{2c}, \ldots, \frac{-ia+3c+p}{2c}, 2; \frac{-ia+3c+p}{2c}+1, \ldots, \frac{-ia+3c+p}{2c}+1; e^{2cz}\Big) - e^{(c+ia+p)z} \sum_{j=0}^{n} \frac{(-1)^j (3c+ia+p)^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\Big(\frac{ia+3c+p}{2c}, \ldots, \frac{ia+3c+p}{2c}, 2; \frac{ia+3c+p}{2c}+1, \ldots, \frac{ia+3c+p}{2c}+1; e^{2cz}\Big)\Bigg) /; n \in \mathbb{N}$$

Involving powers of sin, powers of coth, exp and power

Involving $z^n e^{pz} \sin^m(az) \coth^u(cz) \operatorname{csch}(cz)$

01.23.21.0292.01

$$\int z^n e^{pz} \sin^m(az) \coth^u(cz) \operatorname{csch}(cz)\, dz =$$

$$2^{-m-u} \left(1-e^{2cz}\right)^{u+1} \binom{m}{\frac{m}{2}} n!\, (1 - m \bmod 2) \Bigg(e^{pz} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (p+c(u+1))^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\Big(\frac{p+c(u+1)}{2c}, \ldots, \frac{p+c(u+1)}{2c}, u+1; \frac{p+c(u+1)}{2c}+1, \ldots, \frac{p+c(u+1)}{2c}+1; e^{2cz}\Big) + \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \Bigg(e^{(p-c(u-2s))z} \sum_{j=0}^{n} \frac{(-1)^j (p+c(2s+1))^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\Big(\frac{p+c(2s+1)}{2c}, \ldots, \frac{p+c(2s+1)}{2c}, u+1; \frac{p+c(2s+1)}{2c}+1, \ldots, \frac{p+c(2s+1)}{2c}+1; e^{2cz}\Big) + e^{(p+c(u-2s))z} \sum_{j=0}^{n} \frac{(-1)^j (p+c(-2s+2u+1))^{-j-1} z^{n-j}}{(n-j)!}\, {}_{j+2}F_{j+1}\Big(\frac{p+c(-2s+2u+1)}{2c}, \ldots, \frac{p+c(-2s+2u+1)}{2c}, u+1;$$

$$\left.\left.\left.\frac{p+c(-2s+2u+1)}{2c}+1,\,\ldots,\,\frac{p+c(-2s+2u+1)}{2c}+1;\,e^{2cz}\right)\right)\right)\operatorname{csch}^{u+1}(cz)+2^{-m-u}\left(1-e^{2cz}\right)^{u+1}$$

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

$$_{j+2}F_{j+1}\left(\frac{-i a(m-2k)+p+c(u+1)}{2c},\,\ldots,\,\frac{-i a(m-2k)+p+c(u+1)}{2c},\,u+1;\right.$$

$$\left.\frac{-i a(m-2k)+p+c(u+1)}{2c}+1,\,\ldots,\,\frac{-i a(m-2k)+p+c(u+1)}{2c}+1;\,e^{2cz}\right)+$$

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

$$_{j+2}F_{j+1}\left(\frac{-i a(m-2k)+p+c(2s+1)}{2c},\,\ldots,\,\frac{-i a(m-2k)+p+c(2s+1)}{2c},\,u+1;\right.$$

$$\left.\frac{-i a(m-2k)+p+c(2s+1)}{2c}+1,\,\ldots,\,\frac{-i a(m-2k)+p+c(2s+1)}{2c}+1;\,e^{2cz}\right)+$$

$$e^{(-i a(m-2k)+p+c(u-2s))z}\sum_{j=0}^{n}\frac{(-1)^j\,(-i a(m-2k)+p+c(-2s+2u+1))^{-j-1}\,z^{n-j}}{(n-j)!}$$

$$_{j+2}F_{j+1}\left(\frac{-i a(m-2k)+p+c(-2s+2u+1)}{2c},\,\ldots,\,\frac{-i a(m-2k)+p+c(-2s+2u+1)}{2c},\right.$$

$$u+1;\,\frac{-i a(m-2k)+p+c(-2s+2u+1)}{2c}+1,\,\ldots,$$

$$\left.\left.\left.\frac{-i a(m-2k)+p+c(-2s+2u+1)}{2c}+1;\,e^{2cz}\right)\right)\right)+$$

$$e^{-\frac{1}{2}i m\pi}\left(e^{(a i(m-2k)+p)z}\binom{u}{\frac{u}{2}}(1-u\bmod 2)\sum_{j=0}^{n}\frac{(-1)^j\,(a i(m-2k)+p+c(u+1))^{-j-1}\,z^{n-j}}{(n-j)!}\right.$$

$$_{j+2}F_{j+1}\left(\frac{i a(m-2k)+p+c(u+1)}{2c},\,\ldots,\,\frac{i a(m-2k)+p+c(u+1)}{2c},\,u+1;\right.$$

$$\left.\frac{i a(m-2k)+p+c(u+1)}{2c}+1,\,\ldots,\,\frac{i a(m-2k)+p+c(u+1)}{2c}+1;\,e^{2cz}\right)+$$

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

$$_{j+2}F_{j+1}\left(\frac{i a(m-2k)+p+c(2s+1)}{2c},\,\ldots,\,\frac{i a(m-2k)+p+c(2s+1)}{2c},\,u+1;\right.$$

$$\left.\frac{i a(m-2k)+p+c(2s+1)}{2c}+1,\,\ldots,\,\frac{i a(m-2k)+p+c(2s+1)}{2c}+1;\,e^{2cz}\right)+$$

$$e^{(a i (m-2k)+p+c(u-2s))z} \sum_{j=0}^{n} \frac{(-1)^j (a i (m-2k)+p+c(-2s+2u+1))^{-j-1} z^{n-j}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a (m-2k)+p+c(-2s+2u+1)}{2c}, \ldots, \frac{i a (m-2k)+p+c(-2s+2u+1)}{2c}, u+1; \frac{i a (m-2k)+p+c(-2s+2u+1)}{2c}+1, \ldots, \frac{i a (m-2k)+p+c(-2s+2u+1)}{2c}+1; e^{2cz}\right)\Bigg)\Bigg)\Bigg)\Bigg) \operatorname{csch}^{u+1}(c z) /; n \in \mathbb{N} \land m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

Involving cos, coth, exp and power

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

01.23.21.0293.01

$$\int z^n e^{p z} \cos(a z) \coth(c z) \operatorname{csch}(c z) \, dz = e^{2cz} n! \Bigg(e^{(-i a - c + p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a + p + c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{-i a + p + c}{2c}, \ldots, \frac{-i a + p + c}{2c}, 2; \frac{-i a + p + 3c}{2c}, \ldots, \frac{-i a + p + 3c}{2c}; e^{2cz}\right) + e^{(i a + c + p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i a + p + 3c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a + p + 3c}{2c}, \ldots, \frac{i a + p + 3c}{2c}, 2; \frac{i a + p + 5c}{2c}, \ldots, \frac{i a + p + 5c}{2c}; e^{2cz}\right) + e^{(i a - c + p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i a + p + c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a + p + c}{2c}, \ldots, \frac{i a + p + c}{2c}, 2; \frac{i a + p + 3c}{2c}, \ldots, \frac{i a + p + 3c}{2c}; e^{2cz}\right) + e^{(-i a + c + p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a + p + 3c)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{-i a + p + 3c}{2c}, \ldots, \frac{-i a + p + 3c}{2c}, 2; \frac{-i a + p + 5c}{2c}, \ldots, \frac{-i a + p + 5c}{2c}; e^{2cz}\right)\Bigg) /; n \in \mathbb{N}$$

Involving powers of cos, powers of coth, exp and power

Involving $z^n e^{p z} \cos^m(a z) \coth^u(c z) \operatorname{csch}(c z)$

01.23.21.0294.01

$$\int z^n e^{p z} \cos^m(a z) \coth^u(c z) \operatorname{csch}(c z) \, dz = 2^{-m-u} \left(1 - e^{2cz}\right)^{u+1} \binom{m}{\frac{m}{2}} n! (1 - m \bmod 2) \Bigg(e^{p z} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (p + c(u+1))^{-j-1} z^{n-j}}{(n-j)!}$$

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

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

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

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

$$ \left.\left.\left. u+1; \frac{p+c(-2s+2u+1)}{2c}+1, \ldots, \frac{p+c(-2s+2u+1)}{2c}+1; e^{2cz}\right)\right)\right) \operatorname{csch}^{u+1}(cz) + $$

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

$$ {}_{j+2}F_{j+1}\left(\frac{-ia(m-2k)+p+c(u+1)}{2c}, \ldots, \frac{-ia(m-2k)+p+c(u+1)}{2c}, u+1; \right. $$

$$ \left. \frac{-ia(m-2k)+p+c(u+1)}{2c}+1, \ldots, \frac{-ia(m-2k)+p+c(u+1)}{2c}+1; e^{2cz}\right)+ $$

$$ e^{(ai(m-2k)+p)z} \binom{u}{\frac{u}{2}} (1-u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (ai(m-2k)+p+c(u+1))^{-j-1} z^{n-j}}{(n-j)!} $$

$$ {}_{j+2}F_{j+1}\left(\frac{ia(m-2k)+p+c(u+1)}{2c}, \ldots, \frac{ia(m-2k)+p+c(u+1)}{2c}, u+1; \right. $$

$$ \left. \frac{ia(m-2k)+p+c(u+1)}{2c}+1, \ldots, \frac{ia(m-2k)+p+c(u+1)}{2c}+1; e^{2cz}\right)+ $$

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

$$ {}_{j+2}F_{j+1}\left(\frac{-ia(m-2k)+p+c(2s+1)}{2c}, \ldots, \frac{-ia(m-2k)+p+c(2s+1)}{2c}, u+1; \right. $$

$$ \left. \frac{-ia(m-2k)+p+c(2s+1)}{2c}+1, \ldots, \frac{-ia(m-2k)+p+c(2s+1)}{2c}+1; e^{2cz}\right)+ $$

$$ e^{(-ia(m-2k)+p+c(u-2s))z} \sum_{j=0}^{n} \frac{(-1)^j (-ia(m-2k)+p+c(-2s+2u+1))^{-j-1} z^{n-j}}{(n-j)!} $$

$$ {}_{j+2}F_{j+1}\left(\frac{-ia(m-2k)+p+c(-2s+2u+1)}{2c}, \ldots, \frac{-ia(m-2k)+p+c(-2s+2u+1)}{2c}, \right. $$

$$ u+1; \frac{-ia(m-2k)+p+c(-2s+2u+1)}{2c}+1, \ldots, $$

$$\frac{-i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+1)}{2\,c}+1;\,e^{2\,c\,z}\Bigg)\Bigg)+$$

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

$$\Bigg(\frac{i\,a\,(m-2\,k)+p+c\,(2\,s+1)}{2\,c},\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(2\,s+1)}{2\,c},\,u+1;$$

$$\frac{i\,a\,(m-2\,k)+p+c\,(2\,s+1)}{2\,c}+1,\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(2\,s+1)}{2\,c}+1;\,e^{2\,c\,z}\Bigg)+$$

$$e^{(a\,i\,(m-2\,k)+p+c\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(a\,i\,(m-2\,k)+p+c\,(-2\,s+2\,u+1))^{-j-1}\,z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+1)}{2\,c},\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+1)}{2\,c},$$

$$u+1;\,\frac{i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+1)}{2\,c}+1,\,\ldots,$$

$$\frac{i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+1)}{2\,c}+1;\,e^{2\,c\,z}\Bigg)\Bigg)\Bigg)\Bigg)\operatorname{csch}^{u+1}(c\,z)\;/;\;n\in\mathbb{N}\land m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

Involving functions of the direct function

Involving powers of the direct function

Involving powers of csch

Linear argument

01.23.21.0295.01

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

01.23.21.0296.01

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

01.23.21.0297.01

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

01.23.21.0298.01

$$\int\operatorname{csch}^4(c\,z)\,dz = \frac{\coth(c\,z)\left(2-\operatorname{csch}^2(c\,z)\right)}{3\,c}$$

01.23.21.0299.01

$$\int \operatorname{csch}^5(c z)\,dz = \frac{\coth(c z)\left(3\operatorname{csch}(c z) - 2\operatorname{csch}^3(c z)\right) - 3\log\left(\cosh\left(\frac{c z}{2}\right)\right) + 3\log\left(\sinh\left(\frac{c z}{2}\right)\right)}{8 c}$$

01.23.21.0300.01

$$\int \operatorname{csch}^6(c z)\,dz = -\frac{\coth(c z)\left(3\operatorname{csch}^4(c z) - 4\operatorname{csch}^2(c z) + 8\right)}{15 c}$$

01.23.21.0301.01

$$\int \operatorname{csch}^7(c z)\,dz = \frac{\coth(c z)\left(-8\operatorname{csch}^5(c z) + 10\operatorname{csch}^3(c z) - 15\operatorname{csch}(c z)\right) + 15\left(\log\left(\cosh\left(\frac{c z}{2}\right)\right) - \log\left(\sinh\left(\frac{c z}{2}\right)\right)\right)}{48 c}$$

01.23.21.0302.01

$$\int \operatorname{csch}^8(c z)\,dz = \frac{\coth(c z)\left(-5\operatorname{csch}^6(c z) + 6\operatorname{csch}^4(c z) - 8\operatorname{csch}^2(c z) + 16\right)}{35 c}$$

01.23.21.0593.01

$$\int \operatorname{csch}^{2n}(c z)\,dz = -\frac{\cosh(c z)\operatorname{csch}^{2n-1}(c z)}{c(2n-1)} \sum_{k=0}^{n-1} \frac{(-1)^k (1-n)_k \sinh^{2k}(c z)}{\left(\frac{3}{2}-n\right)_k} \;/;\; n \in \mathbb{N}^+$$

01.23.21.0594.01

$$\int \operatorname{csch}^{2n+1}(c z)\,dz = \frac{4^{-n}(-1)^n \binom{2n}{n} \log\left(\tanh\left(\frac{c z}{2}\right)\right)}{c} - \frac{(-1)^n \cosh(c z)\left(\frac{1}{2}\right)_n}{2 c\, n!} \sum_{k=1}^{n} \frac{(-1)^k \operatorname{csch}^{2k}(c z)(k-1)!}{\left(\frac{1}{2}\right)_k} \;/;\; n \in \mathbb{N}$$

01.23.21.0595.01

$$\int \operatorname{csch}^{2n}(c z)\,dz = -\frac{\cosh(c z)\operatorname{csch}^{2n-1}(c z)}{c(2n-1)}\, {}_2F_1\left(1, 1-n; \frac{3}{2}-n; -\sinh^2(c z)\right) \;/;\; n \in \mathbb{N}^+$$

01.23.21.0596.01

$$\int \operatorname{csch}^{2n+1}(c z)\,dz =$$

$$\frac{(-1)^n \binom{2n}{n}}{4^n c}\left(\tanh^{-1}(\cosh(c z)) - \log\left(\cosh\left(\frac{c z}{2}\right)\right) + \log\left(\sinh\left(\frac{c z}{2}\right)\right)\right) - \frac{(-1)^n \cosh(c z)}{c}\, {}_2F_1\left(\frac{1}{2}, n+1; \frac{3}{2}; \cosh^2(c z)\right) \;/;\; n \in \mathbb{N}$$

01.23.21.0303.01

$$\int \operatorname{csch}^{\frac{1}{2}}(c z)\,dz = \frac{2\operatorname{csch}^{\frac{3}{2}}(c z)\,(i \sinh(c z))^{3/2}}{c} F\left(\frac{1}{4}(\pi - 2 i c z) \,\middle|\, 2\right)$$

01.23.21.0304.01

$$\int \frac{1}{\operatorname{csch}^{\frac{1}{2}}(c z)}\,dz = \frac{2\operatorname{csch}^{\frac{1}{2}}(c z)\sqrt{i \sinh(c z)}}{c} E\left(\frac{1}{4}(\pi - 2 i c z) \,\middle|\, 2\right)$$

Involving products of the direct functions

01.23.21.0305.01

$$\int \operatorname{csch}(b + a z)\operatorname{csch}(a z)\,dz = \frac{\operatorname{csch}(b)\left(\log(\sinh(a z)) - \log(\sinh(b + a z))\right)}{a}$$

01.23.21.0306.01

$$\int \operatorname{csch}(b - a z) \operatorname{csch}(a z) \, dz = \frac{\operatorname{csch}(b) (\log(-\sinh(a z)) - \log(\sinh(b - a z)))}{a}$$

Involving powers of products of the direct function

01.23.21.0307.01

$$\int \sqrt{\operatorname{csch}(c z) \operatorname{csch}(2 c z)} \, dz = -\frac{2^{3/4} \coth^2(c z)^{3/4} \sqrt{\operatorname{csch}(c z) \operatorname{csch}(2 c z)} \tanh(c z)}{3 c \sqrt{\frac{\operatorname{csch}(c z)}{\sqrt{\cosh(2 c z) + 1}}}} \sqrt{\frac{\operatorname{csch}(c z)}{\sqrt{\cosh^2(c z)}}} \, {}_2F_1\left(\frac{3}{4}, \frac{3}{4}; \frac{7}{4}; -\operatorname{csch}^2(c z)\right)$$

Involving rational functions of the direct function

Involving $(a + b \operatorname{csch}(z))^{-n}$

01.23.21.0308.01

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

01.23.21.0309.01

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

Involving $\left(a + b \operatorname{csch}^2(z)\right)^{-n}$

01.23.21.0310.01

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

01.23.21.0311.01

$$\int \frac{1}{\left(a + b \operatorname{csch}^2(z)\right)^2} \, dz = \frac{1}{8 a^2 \left(b \operatorname{csch}^2(z) + a\right)^2} (\cosh(2 z) a - a + 2 b) \operatorname{csch}^4(z) \left(2 z (\cosh(2 z) a - a + 2 b) + \frac{\sqrt{b} (2 b - 3 a) (\cosh(2 z) a - a + 2 b)}{(a - b)^{3/2}} \tan^{-1}\left(\frac{\sqrt{a - b} \tanh(z)}{\sqrt{b}} \right) + \frac{a b \sinh(2 z)}{a - b} \right)$$

Involving algebraic functions of the direct function

Involving $(a + b \operatorname{csch}(c z))^{\beta}$

01.23.21.0312.01

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

01.23.21.0313.01

$$\int \operatorname{csch}(c z)\sqrt{a+b\operatorname{csch}(c z)}\,dz = \frac{1}{\sqrt{\frac{1}{i b-a}}\, b c}\left(2(b-i a)\sqrt{-\frac{b(-i+\operatorname{csch}(c z))}{a+i b}}\,\sqrt{-\frac{b(i+\operatorname{csch}(c z))}{a-i b}}\left(E\left(i\sinh^{-1}\left(\sqrt{\frac{1}{i b-a}}\,\sqrt{a+b\operatorname{csch}(c z)}\right)\middle|\frac{a-i b}{a+i b}\right)-F\left(i\sinh^{-1}\left(\sqrt{\frac{1}{i b-a}}\,\sqrt{a+b\operatorname{csch}(c z)}\right)\middle|\frac{a-i b}{a+i b}\right)\right)\tanh(c z)\right)$$

01.23.21.0314.01

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

Involving $((a+b\operatorname{csch}(c z))^n)^{\beta}$

01.23.21.0315.01

$$\int \operatorname{csch}(c z)\,((a+b\operatorname{csch}(c z))^n)^{\beta}\,dz = -\frac{1}{b c (n\beta+1)}\left(F_1\left(n\beta+1; \frac{1}{2}, \frac{1}{2}; n\beta+2; \frac{a+b\operatorname{csch}(c z)}{a-i b}, \frac{a+b\operatorname{csch}(c z)}{a+i b}\right)\sqrt{\frac{b-i b\operatorname{csch}(c z)}{b+i a}}\,\sqrt{\frac{i\operatorname{csch}(c z)\, b+b}{b-i a}}\,((a+b\operatorname{csch}(c z))^n)^{\beta}\operatorname{sech}(c z)(b+a\sinh(c z))\right)$$

01.23.21.0316.01

$$\int \operatorname{csch}(c z) \sqrt{(a+b \operatorname{csch}(c z))^3}\, dz = \Bigg(\cosh(c z) \sqrt{i \operatorname{csch}(c z)+1} \sqrt{2 i \operatorname{csch}(c z)+2} \sqrt{(a+b \operatorname{csch}(c z))^3} \sinh^3(c z) \Bigg(-2 b (b+a \sinh(c z)) \coth^2(c z) - \frac{1}{\sqrt{-\frac{b (i+\operatorname{csch}(c z))}{a-i b}}} \Bigg((i+\operatorname{csch}(c z)) \sqrt{\frac{a+b \operatorname{csch}(c z)}{a-i b}} \Bigg(8 a \sqrt{-\frac{b(-i+\operatorname{csch}(c z))}{a+i b}} (a+i b) E\Bigg(\sin^{-1}\Bigg(\sqrt{\frac{a+b \operatorname{csch}(c z)}{a-i b}}\Bigg) \Bigg| \frac{a-i b}{a+i b}\Bigg) - 8 i a b \sqrt{-\frac{b(-i+\operatorname{csch}(c z))}{a+i b}} F\Bigg(\sin^{-1}\Bigg(\sqrt{\frac{a+b \operatorname{csch}(c z)}{a-i b}}\Bigg) \Bigg| \frac{a-i b}{a+i b}\Bigg) + (3 a^2-b^2) \sqrt{2 i \operatorname{csch}(c z)+2}\, F\Bigg(\sin^{-1}\Bigg(\sqrt{-\frac{b(i+\operatorname{csch}(c z))}{a-i b}}\Bigg) \Bigg| \frac{b+i a}{2 b}\Bigg)\Bigg) \sinh(c z)\Bigg)\Bigg)\Bigg) \Bigg/ \left(3 c \sqrt{\cosh^2(c z)} \sqrt{\cosh(2 c z)+1} (i+\sinh(c z)) (b+a \sinh(c z))^2\right)$$

01.23.21.0317.01

$$\int \frac{\operatorname{csch}(c z)}{\sqrt{(a+b \operatorname{csch}(c z))^3}}\, dz = -\Bigg(2 (a+b \operatorname{csch}(c z))^{3/2} \Bigg(\frac{1}{\sqrt{\frac{1}{i b-a}}} \Bigg(i (a+i b) \sqrt{\frac{b-i b \operatorname{csch}(c z)}{b+i a}} \sqrt{\frac{i \operatorname{csch}(c z) b+b}{b-i a}} \Bigg(E\Bigg(i \sinh^{-1}\Bigg(\sqrt{\frac{1}{i b-a}} \sqrt{a+b \operatorname{csch}(c z)}\Bigg) \Bigg| \frac{a-i b}{a+i b}\Bigg) - F\Bigg(i \sinh^{-1}\Bigg(\sqrt{\frac{1}{i b-a}} \sqrt{a+b \operatorname{csch}(c z)}\Bigg) \Bigg| \frac{a-i b}{a+i b}\Bigg)\Bigg)\Bigg) - \frac{b^2 \coth^2(c z)}{\sqrt{a+b \operatorname{csch}(c z)}}\Bigg) \tanh(c z)\Bigg) \Bigg/ \left(b (a^2+b^2) c \sqrt{(a+b \operatorname{csch}(c z))^3}\right)$$

Involving $\left(a+b \operatorname{csch}^2(c z)\right)^{\beta}$

01.23.21.0318.01

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

01.23.21.0319.01

$$\int \sqrt{a+b\,\text{csch}^2(c\,z)}\,dz = \left(\sqrt{b\,\text{csch}^2(c\,z)+a}\left(\sqrt{a}\,\log\left(\sqrt{2}\,\sqrt{a}\,\cosh(c\,z)+\sqrt{\cosh(2\,c\,z)\,a-a+2\,b}\right)-\sqrt{b}\,\tanh^{-1}\left(\frac{\sqrt{2}\,\sqrt{b}\,\cosh(c\,z)}{\sqrt{\cosh(2\,c\,z)\,a-a+2\,b}}\right)\right)\sinh(c\,z)\right)\Big/\left(c\sqrt{\frac{1}{2}\cosh(2\,c\,z)\,a-\frac{a}{2}+b}\right)$$

01.23.21.0320.01

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

01.23.21.0321.01

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

01.23.21.0322.01

$$\int \text{csch}(c\,z)\sqrt{a+b\,\text{csch}^2(c\,z)}\,dz = \frac{i\sqrt{\coth^2(c\,z)}\,\sqrt{b\,\text{csch}^2(c\,z)+a}\;E\left(i\sinh^{-1}(\text{csch}(c\,z))\,\middle|\,\frac{b}{a}\right)\tanh(c\,z)}{c\sqrt{\frac{b\,\text{csch}^2(c\,z)}{a}+1}}$$

01.23.21.0323.01

$$\int \frac{\text{csch}(c\,z)}{\sqrt{a+b\,\text{csch}^2(c\,z)}}\,dz = -\frac{i\,\text{csch}(c\,z)\,F\left(i\,c\,z\,\middle|\,\frac{a}{b}\right)}{\sqrt{2}\,c\sqrt{b\,\text{csch}^2(c\,z)+a}}\sqrt{\frac{\cosh(2\,c\,z)\,a-a+2\,b}{b}}$$

Involving $\left(\left(a+b\,\text{csch}^2(c\,z)\right)^n\right)^{\beta}$

01.23.21.0324.01

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

01.23.21.0325.01

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

01.23.21.0326.01

$$\int \frac{1}{\sqrt{\left(a+b\,\text{csch}^2(c\,z)\right)^3}}\,dz = \left(\text{csch}^2(c\,z)\left(\sqrt{2}\,\text{csch}(c\,z)\log\left(\sqrt{2}\,\sqrt{a}\,\cosh(c\,z)+\sqrt{\cosh(2\,c\,z)\,a-a+2\,b}\right)(\cosh(2\,c\,z)\,a-a+2\,b)^{3/2}+\frac{2\sqrt{a}\,b\coth(c\,z)\,(\cosh(2\,c\,z)\,a-a+2\,b)}{a-b}\right)\right)\Big/\left(4\,a^{3/2}\,c\sqrt{\left(b\,\text{csch}^2(c\,z)+a\right)^3}\right)$$

01.23.21.0327.01

$$\int \text{csch}(c\,z)\left(\left(a+b\,\text{csch}^2(c\,z)\right)^n\right)^{\beta}\,dz = -\frac{1}{c}\left(F_1\left(\frac{1}{2};\frac{1}{2},-n\,\beta;\frac{3}{2};-\text{csch}^2(c\,z),-\frac{b\,\text{csch}^2(c\,z)}{a}\right)\sqrt{\coth^2(c\,z)}\left(\left(b\,\text{csch}^2(c\,z)+a\right)^n\right)^{\beta}\left(\frac{b\,\text{csch}^2(c\,z)}{a}+1\right)^{-n\,\beta}\text{sech}(c\,z)\right)$$

01.23.21.0328.01

$$\int \text{csch}(c\,z)\sqrt{\left(a+b\,\text{csch}^2(c\,z)\right)^3}\,dz = \left(\sqrt{\left(b\,\text{csch}^2(c\,z)+a\right)^3}\,\text{sech}(c\,z)\left(\sqrt{\frac{b}{a}}\,b\,(-\cosh(2\,c\,z)\,a+a-2\,b)\coth^2(c\,z)\,\text{csch}^2(c\,z)+4\sqrt{\frac{b\,\text{csch}^2(c\,z)}{a}+1}\,(2\,a-b)\,b\,i\sqrt{\coth^2(c\,z)}\,E\left(i\sinh^{-1}\left(\sqrt{\frac{b}{a}}\,\text{csch}(c\,z)\right)\middle|\frac{a}{b}\right)\sinh(c\,z)+2\sqrt{\frac{b\,\text{csch}^2(c\,z)}{a}+1}\left(3\,a^2-5\,b\,a+2\,b^2\right)i\sqrt{\coth^2(c\,z)}\,F\left(i\sinh^{-1}\left(\sqrt{\frac{b}{a}}\,\text{csch}(c\,z)\right)\middle|\frac{a}{b}\right)\sinh(c\,z)\right)\right)\Big/\left(6\sqrt{\frac{b}{a}}\,c\left(b\,\text{csch}^2(c\,z)+a\right)^2\right)$$

01.23.21.0329.01

$$\int \frac{\operatorname{csch}(c z)}{\sqrt{\left(a + b \operatorname{csch}^2(c z)\right)^3}} \, dz = \left((\cosh(2 c z) a - a + 2 b) \operatorname{csch}^4(c z) \operatorname{sech}(c z) \left(4 \sqrt{\frac{b \operatorname{csch}^2(c z)}{a} + 1} \, b \cosh^2(c z) + 2 i (\cosh(2 c z) a - a + 2 b) \sqrt{\coth^2(c z)} \, E\left(i \sinh^{-1}(\operatorname{csch}(c z)) \,\middle|\, \frac{b}{a} \right) \sinh(c z) \right) \right) \Big/ \left(8 a (a - b) c \sqrt{\left(b \operatorname{csch}^2(c z) + a\right)^3} \sqrt{\frac{b \operatorname{csch}^2(c z)}{a} + 1} \right)$$

Involving functions of the direct function and a power function

Involving powers of the direct function and a power function

Involving powers of csch and power

Involving z^n and linear arguments

01.23.21.0330.01

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

01.23.21.0331.01

$$\int z \operatorname{csch}^\nu(c z) \, dz = \frac{\left(1 - e^{2 c z}\right)^\nu \operatorname{csch}^\nu(c z)}{c^2 \nu^2} \left(c z \nu \, {}_2F_1\left(\frac{\nu}{2}, \nu; \frac{\nu}{2} + 1; e^{2 c z}\right) - {}_3F_2\left(\frac{\nu}{2}, \frac{\nu}{2}, \nu; \frac{\nu}{2} + 1, \frac{\nu}{2} + 1; e^{2 c z}\right) \right)$$

01.23.21.0332.01

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

01.23.21.0333.01

$$\int z \operatorname{csch}^3(c z) \, dz = \frac{-(c z \coth(c z) + 1) \operatorname{csch}(c z) + c z \left(\log(1 + e^{-c z}) - \log(1 - e^{-c z})\right) - \operatorname{Li}_2(-e^{-c z}) + \operatorname{Li}_2(e^{-c z})}{2 c^2}$$

01.23.21.0334.01

$$\int z \operatorname{csch}^4(c z) \, dz = -\frac{\operatorname{csch}^2(c z) + 2 c z \coth(c z) \left(\operatorname{csch}^2(c z) - 2\right) + 4 \log(\sinh(c z))}{6 c^2}$$

01.23.21.0335.01

$$\int z \operatorname{csch}^5(c z) \, dz = \frac{1}{24 c^2} \left(-2 (3 c z \coth(c z) + 1) \operatorname{csch}^3(c z) + 9 (c z \coth(c z) + 1) \operatorname{csch}(c z) + 9 c z \left(\log(1 - e^{-c z}) - \log(1 + e^{-c z})\right) + 9 \operatorname{Li}_2(-e^{-c z}) - 9 \operatorname{Li}_2(e^{-c z}) \right)$$

01.23.21.0336.01

$$\int z^2 \operatorname{csch}^2(c z)\, dz = \frac{c z \left(c z - c \coth(c z) z + 2 \log\left(1 - e^{-2 c z}\right)\right) - \operatorname{Li}_2\left(e^{-2 c z}\right)}{c^3}$$

01.23.21.0337.01

$$\int z^3 \operatorname{csch}^3(c z)\, dz = -\frac{1}{16 c^4} \left(-2 c^4 z^4 + 8 c^3 \coth(c z) \operatorname{csch}(c z) z^3 - 8 c^3 \log(1 + e^{-c z}) z^3 + 8 c^3 \log(1 - e^{c z}) z^3 + 24 c^2 \operatorname{csch}(c z) z^2 + 24 c^2 \operatorname{Li}_2(e^{c z}) z^2 - 48 c \log(1 - e^{-c z}) z + 48 c \log(1 + e^{-c z}) z + 48 c \operatorname{Li}_3(-e^{-c z}) z - 48 c \operatorname{Li}_3(e^{c z}) z + \pi^4 + 24 \left(c^2 z^2 - 2\right) \operatorname{Li}_2(-e^{-c z}) + 48 \operatorname{Li}_2(e^{-c z}) + 48 \operatorname{Li}_4(-e^{-c z}) + 48 \operatorname{Li}_4(e^{c z})\right)$$

Involving functions of the direct function and exponential function

Involving powers of the direct function and exponential function

Involving exp

Involving $e^{b z}$

01.23.21.0338.01

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

01.23.21.0339.01

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

01.23.21.0340.01

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

01.23.21.0341.01

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

01.23.21.0342.01

$$\int e^{2 c z} \operatorname{csch}^4(c z)\, dz = -\frac{8 \left(1 - 3 e^{2 c z} + 3 e^{4 c z}\right)}{3 c \left(-1 + e^{2 c z}\right)^3}$$

01.23.21.0343.01

$$\int e^{-2 c z} \operatorname{csch}^4(c z)\, dz = -\frac{8 e^{2 c z} \left(3 - 3 e^{2 c z} + e^{4 c z}\right)}{3 c \left(-1 + e^{2 c z}\right)^3}$$

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 $z^n e^{b z}$

01.23.21.0344.01

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

01.23.21.0345.01

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

01.23.21.0346.01

$$\int z^n e^{-c z (2 q + \nu)} \operatorname{csch}^\nu(c z)\, dz = n! \left(1 - e^{2 c z}\right)^\nu \operatorname{csch}^\nu(c z) \left(\frac{e^{-c z \nu}\, \Gamma(q + \nu)\, z^{n+1}}{(n+1)!\, q!\, \Gamma(\nu)} - \frac{(\nu)_{q+1}\, e^{-c z (\nu - 2)}}{(q+1)!} \sum_{j=0}^{n} \frac{z^{n-j}}{(-2 c)^{j+1} (n-j)!}\, {}_{j+3}F_{j+2}\!\left(1, \ldots, 1, q + \nu + 1; 2, \ldots, 2, q + 2; e^{2 c z}\right) - \sum_{j=0}^{n} \sum_{k=0}^{q-1} \frac{(\nu)_k\, e^{c z (2 k - 2 q - \nu)}\, z^{n-j}}{(2 c (q - k))^{j+1}\, k!\, (n-j)!}\right) /; n \in \mathbb{N} \land q \in \mathbb{N}^+$$

Involving functions of the direct function and trigonometric functions

Involving powers of the direct function and trigonometric functions

Involving sin

Involving $\sin(b z)$

01.23.21.0347.01

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

Involving powers of sin

Involving $\sin^m(b z)$

01.23.21.0348.01

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

Involving cos

Involving $\cos(b z)$

01.23.21.0349.01

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

Involving powers of cos

Involving $\cos^m(b z)$

01.23.21.0350.01

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

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 $z^n \sin(a + b z) \operatorname{csch}^\nu(c z)$

01.23.21.0351.01

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

01.23.21.0352.01

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

Involving powers of sin and power

Involving $z^n \sin^m(b\,z)\operatorname{csch}^\nu(c\,z)$

01.23.21.0353.01

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

Involving cos and power

Involving $z^n \cos(a+b\,z)\operatorname{csch}^\nu(c\,z)$

01.23.21.0354.01

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

01.23.21.0355.01

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

Involving powers of cos and power

Involving $z^n \cos^m(b\,z)\operatorname{csch}^\nu(c\,z)$

01.23.21.0356.01

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

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 $e^{p z} \sin(a z) \operatorname{csch}^{\nu}(c z)$

01.23.21.0357.01

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

$$p \neq i a - c \nu \land p \neq -i a - c \nu$$

01.23.21.0358.01

$$\int e^{(i a - c \nu) z} \sin(a z) \operatorname{csch}^{\nu}(c z)\, dz = \frac{1}{2} \left(1 - e^{2 c z}\right)^{\nu} \operatorname{csch}^{\nu}(c z) \left(e^{-c z \nu} i z - \frac{e^{z (2 i a - c \nu)}\, {}_2F_1\left(\frac{i a}{c}, \nu; 1 + \frac{i a}{c}; e^{2 c z}\right)}{2 a} + \frac{i e^{c z (2 - \nu)} \nu\, {}_3F_2\left(1, 1, \nu + 1; 2, 2; e^{2 c z}\right)}{2 c}\right)$$

01.23.21.0359.01

$$\int e^{-(i a + c \nu) z} \sin(a z) \operatorname{csch}^{\nu}(c z)\, dz = -\frac{1}{2} \left(1 - e^{2 c z}\right)^{\nu} \operatorname{csch}^{\nu}(c z) \left(e^{-c z \nu} i z + \frac{e^{-z (2 i a + c \nu)}\, {}_2F_1\left(-\frac{i a}{c}, \nu; 1 - \frac{i a}{c}; e^{2 c z}\right)}{2 a} + \frac{i e^{c z (2 - \nu)} \nu\, {}_3F_2\left(1, 1, \nu + 1; 2, 2; e^{2 c z}\right)}{2 c}\right)$$

Involving powers of sin and exp

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

01.23.21.0360.01

$$\int e^{p z} \sin^{m}(a z) \operatorname{csch}^{\nu}(c z)\, dz = \frac{2^{-m} e^{p z} \left(1 - e^{2 c z}\right)^{\nu} (1 - m \bmod 2) \operatorname{csch}^{\nu}(c z)}{p + c \nu} \binom{m}{\frac{m}{2}} {}_2F_1\left(\frac{p + c \nu}{2 c}, \nu; \frac{p + c \nu}{2 c} + 1; e^{2 c z}\right) + 2^{-m} \left(1 - e^{2 c z}\right)^{\nu} \operatorname{csch}^{\nu}(c z)$$

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

$$\left. \frac{e^{\frac{i \pi m}{2} + (p - i a (m - 2 s)) z}}{p - i a (m - 2 s) + c \nu}\, {}_2F_1\left(\frac{p - i a (m - 2 s) + c \nu}{2 c}, \nu; \frac{p - i a (m - 2 s) + c \nu}{2 c} + 1; e^{2 c z}\right)\right) /; m \in \mathbb{N}^{+}$$

Involving cos and exp

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

01.23.21.0361.01

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

01.23.21.0362.01

$$\int e^{(i a-c \nu) z} \cos(a z) \operatorname{csch}^{\nu}(c z)\, dz = \frac{1}{2}\left(1-e^{2 c z}\right)^{\nu} \operatorname{csch}^{\nu}(c z)\left(e^{-c z \nu} z-\frac{i e^{z(2 i a-c \nu)}\, {}_2F_1\left(\frac{i a}{c}, \nu; 1+\frac{i a}{c}; e^{2 c z}\right)}{2 a}+\frac{e^{c z(2-\nu)} \nu\, {}_3F_2\left(1, 1, \nu+1; 2, 2; e^{2 c z}\right)}{2 c}\right)$$

01.23.21.0363.01

$$\int e^{-(i a+c \nu) z} \cos(a z) \operatorname{csch}^{\nu}(c z)\, dz = \frac{1}{2}\left(1-e^{2 c z}\right)^{\nu} \operatorname{csch}^{\nu}(c z)\left(e^{-c z \nu} z+\frac{i e^{-z(2 i a+c \nu)}\, {}_2F_1\left(-\frac{i a}{c}, \nu; 1-\frac{i a}{c}; e^{2 c z}\right)}{2 a}+\frac{e^{c z(2-\nu)} \nu\, {}_3F_2\left(1, 1, \nu+1; 2, 2; e^{2 c z}\right)}{2 c}\right)$$

Involving powers of cos and exp

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

01.23.21.0364.01

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

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 $z^{n} e^{p z} \sin(a+b z) \operatorname{csch}^{\nu}(c z)$

01.23.21.0365.01

$$\int z^n e^{pz}\sin(a+bz)\operatorname{csch}^\nu(cz)\,dz = -\frac{i}{2}\left(1-e^{2cz}\right)^\nu \operatorname{csch}^\nu(cz)\,n!\left(e^{ia+(p+ib)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(ib+p+c\nu)^{-j-1}}{(n-j)!}\right.$$
$$ {}_{j+2}F_{j+1}\left(\frac{c\nu+p+ib}{2c},\ldots,\frac{c\nu+p+ib}{2c},\nu;\frac{c\nu+p+ib}{2c}+1,\ldots,\frac{c\nu+p+ib}{2c}+1;e^{2cz}\right)-$$
$$e^{-ia+(p-ib)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(-ib+p+c\nu)^{-j-1}}{(n-j)!}\;{}_{j+2}F_{j+1}\left(\frac{c\nu+p-ib}{2c},\ldots,\frac{c\nu+p-ib}{2c},\nu;\right.$$
$$\left.\left.\frac{c\nu+p-ib}{2c}+1,\ldots,\frac{c\nu+p-ib}{2c}+1;e^{2cz}\right)\right)/;\, n\in\mathbb{N}\bigwedge p+ib\neq -c\nu\bigwedge p-ib\neq -c\nu$$

01.23.21.0366.01

$$\int z^n e^{pz}\sin(bz)\operatorname{csch}^\nu(cz)\,dz = \frac{i}{2}\left(1-e^{2cz}\right)^\nu \operatorname{csch}^\nu(cz)\,n!\left(e^{(-ib+p)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(-ib+p+c\nu)^{-j-1}}{(n-j)!}\right.$$
$$ {}_{j+2}F_{j+1}\left(\frac{c\nu+p-ib}{2c},\ldots,\frac{c\nu+p-ib}{2c},\nu;\frac{c\nu+p-ib}{2c}+1,\ldots,\frac{c\nu+p-ib}{2c}+1;e^{2cz}\right)-$$
$$e^{(ib+p)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(ib+p+c\nu)^{-j-1}}{(n-j)!}\;{}_{j+2}F_{j+1}\left(\frac{c\nu+p+ib}{2c},\ldots,\frac{c\nu+p+ib}{2c},\nu;\frac{c\nu+p+ib}{2c}+1,\right.$$
$$\left.\left.\ldots,\frac{c\nu+p+ib}{2c}+1;e^{2cz}\right)\right)/;\, n\in\mathbb{N}\bigwedge p+ib\neq -c\nu\bigwedge p-ib\neq -c\nu$$

01.23.21.0367.01

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

01.23.21.0368.01

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

Involving powers of sin, exp and power

Involving $z^n e^{pz}\sin^m(bz)\operatorname{csch}^\nu(cz)$

01.23.21.0369.01

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

Involving cos, exp and power

Involving $z^n e^{pz}\cos(a+bz)\operatorname{csch}^\nu(cz)$

01.23.21.0370.01

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

01.23.21.0371.01

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

01.23.21.0372.01

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

01.23.21.0373.01

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

Involving powers of cos, exp and power

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

01.23.21.0374.01

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

Involving functions of the direct function and hyperbolic functions

Involving powers of the direct function and hyperbolic functions

Involving sinh

Involving sinh($b\,z$)

01.23.21.0375.01

$$\int\sinh(bz)\operatorname{csch}^\nu(cz)\,dz = \frac{1}{2}\left(1-e^{2cz}\right)^\nu\operatorname{csch}^\nu(cz)\left(\frac{e^{bz}\,{}_2F_1\left(\frac{b}{2c}+\frac{\nu}{2},\nu;\frac{b}{2c}+\frac{\nu}{2}+1;e^{2cz}\right)}{b+c\nu}+\frac{e^{-bz}\,{}_2F_1\left(\frac{\nu}{2}-\frac{b}{2c},\nu;-\frac{b}{2c}+\frac{\nu}{2}+1;e^{2cz}\right)}{b-c\nu}\right)\;/;\;b\neq c\nu\land b\neq -c\nu$$

01.23.21.0376.01

$$\int\sinh(c\nu z)\operatorname{csch}^\nu(cz)\,dz = \frac{1}{2}\left(1-e^{2cz}\right)^\nu\operatorname{csch}^\nu(cz)\left(-e^{-c\nu z}z+\frac{e^{c\nu z}\,{}_2F_1\left(\nu,\nu;\nu+1;e^{2cz}\right)}{2c\nu}-\frac{e^{-c(\nu-2)z}\,\nu\,{}_3F_2\left(1,1,\nu+1;2,2;e^{2cz}\right)}{2c}\right)$$

01.23.21.0377.01

$$\int\sinh(cz)\operatorname{csch}^\nu(cz)\,dz = \frac{\cosh(cz)\operatorname{csch}^\nu(cz)\left(-\sinh^2(cz)\right)^{\nu/2}}{c}\,{}_2F_1\left(\frac{1}{2},\frac{\nu}{2};\frac{3}{2};\cosh^2(cz)\right)$$

01.23.21.0378.01

$$\int \sinh(c\,z)\,\operatorname{csch}^2(c\,z)\,dz = \frac{\log\left(\tanh\left(\frac{c\,z}{2}\right)\right)}{c}$$

01.23.21.0379.01

$$\int \sinh(4\,z)\,\operatorname{csch}^4(z)\,dz = 8\log(\sinh(z)) - 2\operatorname{csch}^2(z)$$

Involving power of sinh

Involving $\sinh^u(b\,z)\operatorname{csch}^\nu(c\,z)$

01.23.21.0380.01

$$\int \sinh^u(b\,z)\,\operatorname{csch}^\nu(c\,z)\,dz =$$

$$\left(1-e^{2\,c\,z}\right)^\nu \operatorname{csch}^\nu(c\,z)\left(\frac{i}{2}\right)^u \sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\left(\frac{e^{b\,(u-2\,k)\,z-\frac{i\,\pi\,u}{2}}}{b\,(u-2\,k)+c\,\nu}\,{}_2F_1\left(-\frac{b\,k}{c}+\frac{b\,u}{2\,c}+\frac{\nu}{2},\,\nu;\,-\frac{b\,k}{c}+\frac{b\,u}{2\,c}+\frac{\nu}{2}+1;\,e^{2\,c\,z}\right)+\right.$$

$$\left.\frac{e^{\frac{i\,\pi\,u}{2}-b\,(u-2\,k)\,z}}{c\,\nu-b\,(u-2\,k)}\,{}_2F_1\left(\frac{b\,k}{c}+\frac{\nu}{2}-\frac{b\,u}{2\,c},\,\nu;\,\frac{b\,k}{c}+\frac{\nu}{2}-\frac{b\,u}{2\,c}+1;\,e^{2\,c\,z}\right)\right)+$$

$$\left(\frac{i}{2}\right)^u\frac{\left(1-e^{2\,c\,z}\right)^\nu(1-u\bmod 2)}{c\,\nu}\binom{u}{\frac{u}{2}}\operatorname{csch}^\nu(c\,z)\,{}_2F_1\left(\frac{\nu}{2},\,\nu;\,\frac{\nu}{2}+1;\,e^{2\,c\,z}\right)\ /;\ u\in\mathbb{N}^+$$

01.23.21.0381.01

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

01.23.21.0382.01

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

01.23.21.0383.01

$$\int \sinh^{\frac{1}{2}}(2\,c\,z)\,\operatorname{csch}^3(c\,z)\,dz = -\frac{2\coth(c\,z)\operatorname{csch}(c\,z)\sinh^{\frac{1}{2}}(2\,c\,z)}{3\,c}$$

01.23.21.0384.01

$$\int \frac{\operatorname{csch}^3(c\,z)}{\sinh^{\frac{1}{2}}(2\,c\,z)}\,dz = -\frac{\operatorname{csch}(c\,z)\left(\operatorname{csch}^2(c\,z)-4\right)\sinh^{\frac{1}{2}}(2\,c\,z)}{5\,c}$$

01.23.21.0385.01

$$\int \sqrt{\sinh^3(2\,c\,z)}\,\operatorname{csch}^5(c\,z)\,dz = -\frac{2\coth(c\,z)\operatorname{csch}^3(c\,z)\sqrt{\sinh^3(2\,c\,z)}}{5\,c}$$

Involving algebraic functions of sinh

01.23.21.0386.01

$$\int \sqrt{a+b\sinh(c z)}\ \operatorname{csch}^2(c z)\,dz = -\Bigg((\cosh(c z)+\cosh(3 c z))\operatorname{csch}(c z)\operatorname{sech}^2(c z)\operatorname{sech}(2 c z)\Bigg(a\Bigg(b\Bigg(2\sqrt{\frac{1}{i b-a}}\cosh(c z)\Bigg(b\sqrt{\frac{a+b\sinh(c z)}{a-i b}}\,\Pi\!\left(2;\frac{1}{4}(\pi-2 i c z)\,\middle|\,-\frac{2 i b}{a-i b}\right)\sinh(c z)+2\cosh(c z)(a+b\sinh(c z))\Bigg)-4F\!\left(i\sinh^{-1}\!\left(\sqrt{\frac{1}{i b-a}}\sqrt{a+b\sinh(c z)}\right)\middle|\,\frac{a-i b}{a+i b}\right)\sinh(c z)\sqrt{-\frac{b(-i+\sinh(c z))}{a+i b}}\sqrt{-\frac{b(i+\sinh(c z))}{a-i b}}\sqrt{a+b\sinh(c z)}\Bigg)+4(b-i a)\sqrt{-\frac{b(-i+\sinh(c z))}{a+i b}}\sqrt{-\frac{b(i+\sinh(c z))}{a-i b}}\,E\!\left(i\sinh^{-1}\!\left(\sqrt{\frac{1}{i b-a}}\sqrt{a+b\sinh(c z)}\right)\middle|\,\frac{a-i b}{a+i b}\right)\sinh(c z)\sqrt{a+b\sinh(c z)}\Bigg)-2 i b^2\,\Pi\!\left(1-\frac{i b}{a};i\sinh^{-1}\!\left(\sqrt{\frac{1}{i b-a}}\sqrt{a+b\sinh(c z)}\right)\middle|\,\frac{a-i b}{a+i b}\right)\sinh(c z)\sqrt{-\frac{b(-i+\sinh(c z))}{a+i b}}\sqrt{-\frac{b(i+\sinh(c z))}{a-i b}}\sqrt{a+b\sinh(c z)}\Bigg)\Bigg)\Bigg/\left(8 a\sqrt{\frac{1}{i b-a}}\,b c\sqrt{a+b\sinh(c z)}\right)$$

Involving cosh

Involving cosh$(b z)$

01.23.21.0387.01

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

01.23.21.0388.01

$$\int \cosh(c\nu z)\operatorname{csch}^{\nu}(c z)\,dz = \frac{1}{2}\left(1-e^{2 c z}\right)^{\nu}\operatorname{csch}^{\nu}(c z)\left(e^{-c\nu z}z+\frac{e^{c\nu z}\,{}_2F_1\!\left(\nu,\nu;\nu+1;e^{2 c z}\right)}{2 c\nu}+\frac{e^{-c(\nu-2)z}\,\nu\,{}_3F_2\!\left(1,1,\nu+1;2,2;e^{2 c z}\right)}{2c}\right)$$

01.23.21.0389.01

$$\int \cosh(c z)\operatorname{csch}^{\nu}(c z)\,dz = \frac{\operatorname{csch}^{\nu-1}(c z)}{c-c\nu}$$

01.23.21.0390.01

$$\int \cosh(2z)\,\mathrm{csch}^3(z)\,dz = \frac{1}{2}\left(-\coth(z)\,\mathrm{csch}(z) - 3\log\left(\cosh\left(\frac{z}{2}\right)\right) + 3\log\left(\sinh\left(\frac{z}{2}\right)\right)\right)$$

01.23.21.0391.01

$$\int \cosh(4z)\,\mathrm{csch}^5(z)\,dz = \frac{1}{8}\left(35\left(\log\left(\sinh\left(\frac{z}{2}\right)\right) - \log\left(\cosh\left(\frac{z}{2}\right)\right)\right) - \coth(z)\,\mathrm{csch}(z)\left(2\,\mathrm{csch}^2(z) + 29\right)\right)$$

01.23.21.0392.01

$$\int \cosh(5z)\,\mathrm{csch}^5(z)\,dz = -\frac{1}{4}\,\mathrm{csch}^4(z) - 6\,\mathrm{csch}^2(z) + 16\log(\sinh(z))$$

Involving power of cosh

Involving $\cosh^u(b\,z)\,\mathrm{csch}^\nu(c\,z)$

01.23.21.0393.01

$$\int \cosh^u(b\,z)\,\mathrm{csch}^\nu(c\,z)\,dz = 2^{-u}\left(1 - e^{2cz}\right)^\nu \mathrm{csch}^\nu(c\,z)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{k}\left(\frac{e^{b(u-2k)z}\,{}_2F_1\left(-\frac{bk}{c} + \frac{bu}{2c} + \frac{\nu}{2}, \nu; -\frac{bk}{c} + \frac{bu}{2c} + \frac{\nu}{2} + 1; e^{2cz}\right)}{b(u-2k) + c\,\nu} + \frac{e^{-b(u-2k)z}\,{}_2F_1\left(\frac{bk}{c} + \frac{\nu}{2} - \frac{bu}{2c}, \nu; \frac{bk}{c} + \frac{\nu}{2} - \frac{bu}{2c} + 1; e^{2cz}\right)}{c\,\nu - b(u-2k)}\right) + \frac{2^{-u}\left(1 - e^{2cz}\right)^\nu (1 - u \bmod 2)\,\mathrm{csch}^\nu(c\,z)}{c\,\nu}\binom{u}{\frac{u}{2}}\,{}_2F_1\left(\frac{\nu}{2}, \nu; \frac{\nu}{2} + 1; e^{2cz}\right) /; u \in \mathbb{N}^+$$

01.23.21.0394.01

$$\int \cosh^\mu(c\,z)\,\mathrm{csch}^\nu(c\,z)\,dz = -\frac{\cosh^{\mu+1}(c\,z)\,\mathrm{csch}^{\nu-1}(c\,z)\left(-\sinh^2(c\,z)\right)^{\frac{\nu-1}{2}}}{c(\mu+1)}\,{}_2F_1\left(\frac{\mu+1}{2}, \frac{\nu+1}{2}; \frac{\mu+3}{2}; \cosh^2(c\,z)\right)$$

01.23.21.0395.01

$$\int \sqrt{\cosh^3(2z)}\,\mathrm{csch}^3(z)\,dz = -\frac{1}{4}\sqrt{\cosh^3(2z)}\left(2\sqrt{-\cosh(2z)}\,\tan^{-1}\left(\frac{\cosh(z)}{\sqrt{-\cosh(2z)}}\right) + \cosh(z)\left(\coth^2(z) + 3\right) + \coth(z)\,\mathrm{csch}(z) - 8\sqrt{2}\,\cosh^{\frac{1}{2}}(2z)\log\left(\sqrt{2}\,\cosh(z) + \cosh^{\frac{1}{2}}(2z)\right) + 8\tanh^{-1}\left(\frac{\cosh(z)}{\cosh^{\frac{1}{2}}(2z)}\right)\cosh^{\frac{1}{2}}(2z)\right)\mathrm{sech}^2(2z)$$

Involving algebraic functions of cosh

01.23.21.0396.01

$$\int \sqrt{a+b\cosh(2cz)}\,\operatorname{csch}^2(cz)\,dz = \frac{1}{c\sqrt{a+b\cosh(2cz)}}\left(-(a+b\cosh(2cz))\coth(cz) - i(a+b)\sqrt{\frac{a+b\cosh(2cz)}{a+b}}\,E\!\left(icz\,\middle|\,\frac{2b}{a+b}\right) + (a-b)\sqrt{\frac{a+b\cosh(2cz)}{a+b}}\,i\,F\!\left(icz\,\middle|\,\frac{2b}{a+b}\right)\right)$$

01.23.21.0397.01

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

01.23.21.0398.01

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

01.23.21.0399.01

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

01.23.21.0400.01

$$\int \sqrt{a+b\cosh(2cz)}\,\operatorname{csch}^4(cz)\,dz = \frac{1}{6(a+b)c\sqrt{a+b\cosh(2cz)}}\left(\left(2\left(a^2-2ba-b^2\right)\cosh(2cz) - a(4a+b-b\cosh(4cz))\right)\coth(cz)\operatorname{csch}^2(cz) + 4a\sqrt{\frac{a+b\cosh(2cz)}{a+b}}\,(a+b)\,i\,E\!\left(icz\,\middle|\,\frac{2b}{a+b}\right) - 4i\left(a^2-b^2\right)\sqrt{\frac{a+b\cosh(2cz)}{a+b}}\,F\!\left(icz\,\middle|\,\frac{2b}{a+b}\right)\right)$$

01.23.21.0401.01

$$\int \cosh(2cz)\sqrt{a+b\cosh(2cz)}\,\operatorname{csch}^2(cz)\,dz = \frac{1}{c\sqrt{a+b\cosh(2cz)}}\left(-(a+b\cosh(2cz))\coth(cz) - 3i(a+b)\sqrt{\frac{a+b\cosh(2cz)}{a+b}}\,E\!\left(icz\,\middle|\,\frac{2b}{a+b}\right) + (a-b)\sqrt{\frac{a+b\cosh(2cz)}{a+b}}\,i\,F\!\left(icz\,\middle|\,\frac{2b}{a+b}\right)\right)$$

01.23.21.0402.01

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

01.23.21.0403.01

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

01.23.21.0404.01

$$\int \frac{\operatorname{csch}^2(c z)}{\sqrt{a+b\cosh(2 c z)}}\, dz = \frac{1}{(a+b)\, c \sqrt{a+b\cosh(2 c z)}} \left(-(a+b\cosh(2 c z))\coth(c z) - i\,(a+b)\sqrt{\frac{a+b\cosh(2 c z)}{a+b}}\, E\!\left(i\, c\, z \,\middle|\, \frac{2 b}{a+b}\right) + \sqrt{\frac{a+b\cosh(2 c z)}{a+b}}\,(a+b)\, i\, F\!\left(i\, c\, z \,\middle|\, \frac{2 b}{a+b}\right)\right)$$

01.23.21.0405.01

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

01.23.21.0406.01

$$\int \frac{\operatorname{csch}^4(c z)}{\sqrt{a+b\cosh(2 c z)}}\, dz = \left(\frac{1}{2}\left(-4 a^2 - 7 b a + 3 b^2 + 2\left(a^2 + b a - 4 b^2\right)\cosh(2 c z) + b\,(a+3 b)\cosh(4 c z)\right)\coth(c z)\operatorname{csch}^2(c z) + 2\sqrt{\frac{a+b\cosh(2 c z)}{a+b}}\left(a^2 + 4 b a + 3 b^2\right) i\, E\!\left(i\, c\, z \,\middle|\, \frac{2 b}{a+b}\right) - 2\, i\left(a^2 + 3 b a + 2 b^2\right)\sqrt{\frac{a+b\cosh(2 c z)}{a+b}}\, F\!\left(i\, c\, z \,\middle|\, \frac{2 b}{a+b}\right)\right) \Big/ \left(3\,(a+b)^2\, c \sqrt{a+b\cosh(2 c z)}\right)$$

01.23.21.0407.01

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

Involving tanh

Involving $\tanh(c\, z)\operatorname{csch}^{\nu}(c\, z)$

01.23.21.0408.01

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

01.23.21.0409.01

$$\int \tanh(z)\operatorname{csch}^2(z)\, dz = \log(\sinh(z)) - \log(\cosh(z))$$

01.23.21.0410.01

$$\int \tanh(z)\operatorname{csch}^3(z)\, dz = -2\tan^{-1}\!\left(\tanh\!\left(\frac{z}{2}\right)\right) - \operatorname{csch}(z)$$

Involving power of tanh

Involving $\tanh^{\mu}(c\,z)\,\operatorname{csch}^{\nu}(c\,z)$

01.23.21.0411.01

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

01.23.21.0412.01

$$\int \tanh^2(z)\operatorname{csch}^2(z)\,dz = \tanh(z)$$

01.23.21.0413.01

$$\int \tanh^2(z)^{2/3}\operatorname{csch}^2(z)\,dz = 3\coth(z)\tanh^2(z)^{2/3}$$

01.23.21.0414.01

$$\int \tanh^{\frac{1}{a}}(c\,z)^{b}\operatorname{csch}^2(c\,z)\,dz = -\frac{a\coth(c\,z)\tanh^{\frac{1}{a}}(c\,z)^{b}}{(a-b)\,c}$$

01.23.21.0415.01

$$\int \sqrt{\tanh^3(z)}\operatorname{csch}^4(z)\,dz = -\frac{2}{3}\coth(z)\left(\operatorname{csch}^2(z)+4\right)\sqrt{\tanh^3(z)}$$

01.23.21.0416.01

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

01.23.21.0417.01

$$\int \tanh^5(z)\sqrt[4]{\operatorname{csch}^3(z)}\,dz = \frac{1}{256}\sqrt[4]{\operatorname{csch}^3(z)}\left(65\operatorname{csch}^{\frac{5}{4}}(z)\left(\cos\!\left(\frac{3\pi}{8}\right)\log\!\left(-2\cos\!\left(\frac{\pi}{8}\right)\operatorname{csch}^{\frac{1}{4}}(z)+\operatorname{csch}^{\frac{1}{2}}(z)+1\right)+\cos\!\left(\frac{9\pi}{8}\right)\log\!\left(-2\cos\!\left(\frac{3\pi}{8}\right)\operatorname{csch}^{\frac{1}{4}}(z)+\operatorname{csch}^{\frac{1}{2}}(z)+1\right)+\right.\right.$$
$$\cos\!\left(\frac{15\pi}{8}\right)\log\!\left(-2\cos\!\left(\frac{5\pi}{8}\right)\operatorname{csch}^{\frac{1}{4}}(z)+\operatorname{csch}^{\frac{1}{2}}(z)+1\right)+$$
$$\cos\!\left(\frac{21\pi}{8}\right)\log\!\left(-2\cos\!\left(\frac{7\pi}{8}\right)\operatorname{csch}^{\frac{1}{4}}(z)+\operatorname{csch}^{\frac{1}{2}}(z)+1\right)-2\tan^{-1}\!\left(\csc\!\left(\frac{\pi}{8}\right)\left(\operatorname{csch}^{\frac{1}{4}}(z)-\cos\!\left(\frac{\pi}{8}\right)\right)\right)\sin\!\left(\frac{3\pi}{8}\right)-$$
$$2\tan^{-1}\!\left(\csc\!\left(\frac{3\pi}{8}\right)\left(\operatorname{csch}^{\frac{1}{4}}(z)-\cos\!\left(\frac{3\pi}{8}\right)\right)\right)\sin\!\left(\frac{9\pi}{8}\right)-2\tan^{-1}\!\left(\csc\!\left(\frac{5\pi}{8}\right)\left(\operatorname{csch}^{\frac{1}{4}}(z)-\cos\!\left(\frac{5\pi}{8}\right)\right)\right)\sin\!\left(\frac{15\pi}{8}\right)-$$
$$\left.\left.2\tan^{-1}\!\left(\csc\!\left(\frac{7\pi}{8}\right)\left(\operatorname{csch}^{\frac{1}{4}}(z)-\cos\!\left(\frac{7\pi}{8}\right)\right)\right)\sin\!\left(\frac{21\pi}{8}\right)\right)-4\,(21\cosh(2\,z)+5)\operatorname{sech}^4(z)\right)\sinh^2(z)$$

01.23.21.0418.01

$$\int \tanh^5(z)\sqrt{\operatorname{csch}^3(z)}\,dz = \frac{1}{128}\sqrt{\operatorname{csch}^3(z)} \left(5\sqrt{2}\operatorname{csch}^{\frac{1}{2}}(z)\left(-2\tan^{-1}\left(\sqrt{2}\operatorname{csch}^{\frac{1}{2}}(z)+1\right)+2\tan^{-1}\left(1-\sqrt{2}\operatorname{csch}^{\frac{1}{2}}(z)\right)-\log\left(-\operatorname{csch}(z)+\sqrt{2}\operatorname{csch}^{\frac{1}{2}}(z)-1\right)+\log\left(\operatorname{csch}(z)+\sqrt{2}\operatorname{csch}^{\frac{1}{2}}(z)+1\right)\right)-4\,(9\cosh(2z)+1)\operatorname{sech}^4(z)\right)\sinh^2(z)$$

01.23.21.0419.01

$$\int \sqrt{\tanh(z)\operatorname{csch}^4(z)}\,dz = -2\cosh(z)\sqrt{\operatorname{csch}^3(z)\operatorname{sech}(z)}\,\sinh(z)$$

01.23.21.0420.01

$$\int \sqrt[3]{\tanh^2(z)\operatorname{csch}^{12}(z)}\,dz = \frac{3}{14}\,(3\cosh(3z)-5\cosh(z))\sqrt[3]{\operatorname{csch}^{10}(z)\operatorname{sech}^2(z)}\,\sinh(z)$$

Involving coth

Involving $\coth(c z)\operatorname{csch}^{\nu}(c z)$

01.23.21.0421.01

$$\int \coth(c z)\operatorname{csch}^{\nu}(c z)\,dz = -\frac{1}{c\,\nu}\left(\left(1-\cosh^2(c z)\right)^{-\frac{\nu}{2}}-1\right)\operatorname{csch}^{\nu}(c z)\left(-\sinh^2(c z)\right)^{\nu/2}$$

01.23.21.0422.01

$$\int \coth(z)\operatorname{csch}^2(z)\,dz = -\frac{1}{2}\coth^2(z)$$

01.23.21.0423.01

$$\int \coth(z)\operatorname{csch}^3(z)\,dz = -\frac{1}{3}\operatorname{csch}^3(z)$$

Involving power of coth

Involving $\coth^{\mu}(c z)\operatorname{sech}^{\nu}(c z)$

01.23.21.0424.01

$$\int \coth^{\mu}(c z)\operatorname{csch}^{\nu}(c z)\,dz = -\frac{\cosh(c z)\coth^{\mu}(c z)\operatorname{csch}^{\nu-1}(c z)\left(-\sinh^2(c z)\right)^{\frac{1}{2}(\mu+\nu-1)}}{c\,(\mu+1)}\,{}_2F_1\left(\frac{\mu+1}{2},\frac{1}{2}(\mu+\nu+1);\frac{\mu+3}{2};\cosh^2(c z)\right)$$

01.23.21.0425.01

$$\int \coth^{u}(c z)\operatorname{csch}^{\nu}(c z)\,dz = 2^{-u}\left(1-e^{2cz}\right)^{u+\nu}\operatorname{csch}^{u+\nu}(c z)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{k}\left(\frac{e^{-c(u-2k)z}}{c\,(2k+\nu)}\,{}_2F_1\left(k+\frac{\nu}{2},u+\nu;k+\frac{\nu}{2}+1;e^{2cz}\right)+\frac{e^{c(u-2k)z}}{c\,(-2k+2u+\nu)}\,{}_2F_1\left(-k+u+\frac{\nu}{2},u+\nu;-k+u+\frac{\nu}{2}+1;e^{2cz}\right)\right)+\frac{2^{-u}\left(1-e^{2cz}\right)^{u+\nu}(1-u\bmod 2)\operatorname{csch}^{u+\nu}(c z)}{c\,(u+\nu)}\binom{u}{\frac{u}{2}}\,{}_2F_1\left(\frac{u+\nu}{2},u+\nu;\frac{u+\nu}{2}+1;e^{2cz}\right)\;/;\;u\in\mathbb{N}^+$$

01.23.21.0426.01

$$\int \coth^2(z)\,\text{csch}^2(z)\,dz = -\frac{1}{3}\coth^3(z)$$

01.23.21.0427.01

$$\int \coth^4(z)\,\text{csch}^3(z)\,dz = \frac{1}{48}\left(3\left(\log\left(\cosh\left(\frac{z}{2}\right)\right) - \log\left(\sinh\left(\frac{z}{2}\right)\right)\right) - \coth(z)\,\text{csch}(z)\left(8\,\text{csch}^4(z) + 14\,\text{csch}^2(z) + 3\right)\right)$$

01.23.21.0428.01

$$\int \coth^3(c\,z)\,\text{csch}^4(c\,z)\,dz = -\frac{(3\cosh(2\,c\,z) + 1)\,\text{csch}^6(c\,z)}{24\,c}$$

01.23.21.0429.01

$$\int \coth^{\frac{1}{a}}(c\,z)^b\,\text{csch}^2(c\,z)\,dz = -\frac{a\coth(c\,z)\coth^{\frac{1}{a}}(c\,z)^b}{(a+b)\,c}$$

01.23.21.0430.01

$$\int \coth(c\,z)\,\text{csch}^{\frac{1}{a}}(c\,z)^b\,dz = -\frac{a\,\text{csch}^{\frac{1}{a}}(c\,z)^b}{b\,c}$$

Involving cosh and tanh

01.23.21.0431.01

$$\int \sqrt{a + b\cosh(2\,c\,z)}\,\tanh(c\,z)\,\text{csch}^2(c\,z)\,dz =$$

$$\frac{1}{c}\left(\sqrt{a-b}\,\tanh^{-1}\left(\frac{\sqrt{a + b\cosh(2\,c\,z)}}{\sqrt{a-b}}\right) - \sqrt{a+b}\,\tanh^{-1}\left(\frac{\sqrt{a + b\cosh(2\,c\,z)}}{\sqrt{a+b}}\right)\right)$$

01.23.21.0432.01

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

01.23.21.0433.01

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

01.23.21.0434.01

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

01.23.21.0435.01

$$\int \frac{\tanh^2(c z)\operatorname{csch}^2(c z)}{\sqrt{a+b\cosh(2 c z)}}\,dz = \left(\sqrt{\frac{a+b\cosh(2 c z)}{a+b}}\,(a+b)\,i\,E\!\left(i c z \,\middle|\, \frac{2b}{a+b}\right) - i\,(a-b)\sqrt{\frac{a+b\cosh(2 c z)}{a+b}}\,F\!\left(i c z \,\middle|\, \frac{2b}{a+b}\right) + (a+b\cosh(2 c z))\tanh(c z)\right) \Big/ \left((a-b)\,c\,\sqrt{a+b\cosh(2 c z)}\right)$$

Involving cosh and coth

01.23.21.0436.01

$$\int \frac{(\cosh(2z)-3)\operatorname{csch}^4(z)}{\sqrt{4-\coth^2(z)}}\,dz = -\frac{(3\cosh(2z)-5)\coth(z)\operatorname{csch}^2(z)}{2\sqrt{4-\coth^2(z)}}$$

Involving rational functions of the direct function and hyperbolic functions

Involving rational functions of sinh

Involving $(a\sinh(z)+b\operatorname{csch}(z))^{-n}$

01.23.21.0437.01

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

01.23.21.0438.01

$$\int \frac{1}{(a\sinh(z)+b\operatorname{csch}(z))^2}\,dz = \frac{(\cosh(2z)\,a-a+2b)\operatorname{csch}^2(z)}{8\,(b\operatorname{csch}(z)+a\sinh(z))^2}\left(\frac{\tan^{-1}\!\left(\frac{\sqrt{a-b}\,\tanh(z)}{\sqrt{b}}\right)(\cosh(2z)\,a-a+2b)}{(a-b)^{3/2}\sqrt{b}} + \frac{2\cosh(z)\sinh(z)}{b-a}\right)$$

Involving rational functions of cosh

Involving $(a\cosh(z)+b\operatorname{csch}(z))^{-n}$

01.23.21.0439.01

$$\int \frac{1}{a\cosh(z)+b\operatorname{csch}(z)}\,dz = \left((1+i)\left(4\sqrt{2b+ia}\,\tan^{-1}\left(\frac{\sqrt{a}\,(-1+i)+\left((1+i)\sqrt{a}-\sqrt{4b+2ia}\right)\tanh\left(\frac{z}{2}\right)}{\sqrt{2ia-4b}}\right)-4\sqrt{2b+ia}\,\tan^{-1}\left(\frac{(1-i)\sqrt{a}-\left(\sqrt{a}\,(1+i)+\sqrt{4b+2ia}\right)\tanh\left(\frac{z}{2}\right)}{\sqrt{2ia-4b}}\right)-i\sqrt{4ia-8b}\,\left(\log\left(\sqrt{a}\,(1+i)\cosh(z)-(1-i)\sqrt{a}\,\sinh(z)+\sqrt{4b+2ia}\right)-\log\left(-(1+i)\sqrt{a}\,\cosh(z)+\sqrt{a}\,(1-i)\sinh(z)+\sqrt{4b+2ia}\right)\right)\right)\right)\Big/\left(4\left(\sqrt{a}\,\sqrt{2ia-4b}\,\sqrt{2b+ia}\right)\right)$$

01.23.21.0440.01

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

Involving rational functions of tanh

Involving $(a\tanh(z)+b\operatorname{csch}(z))^{-n}$

01.23.21.0441.01

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

01.23.21.0442.01

$$\int \frac{1}{(a\tanh(z)+b\operatorname{csch}(z))^2}\,dz = \frac{1}{a^2}\left(\left(\left(\sqrt{b}\sqrt{\sqrt{4a^2+b^2}-b}\left(\sqrt{-b\left(b+\sqrt{4a^2+b^2}\right)}\,z\left(4a^2+b^2\right)^{3/2}+\sqrt{2}\left(4a^4+b\left(7b+5\sqrt{4a^2+b^2}\right)a^2+b^3\left(b+\sqrt{4a^2+b^2}\right)\right)\tan^{-1}\left(\frac{\left(-2a+b+\sqrt{4a^2+b^2}\right)\tanh\left(\frac{z}{2}\right)}{\sqrt{2}\sqrt{-b\left(b+\sqrt{4a^2+b^2}\right)}}\right)\right)-\sqrt{2}\sqrt{-b\left(b+\sqrt{4a^2+b^2}\right)}\left(-4a^4+b\left(5\sqrt{4a^2+b^2}-7b\right)a^2+b^3\left(\sqrt{4a^2+b^2}-b\right)\right)\tan^{-1}\left(\frac{\left(2a-b+\sqrt{4a^2+b^2}\right)\tanh\left(\frac{z}{2}\right)}{\sqrt{2}\sqrt{b}\sqrt{\sqrt{4a^2+b^2}-b}}\right)\right)\Big/\left(\sqrt{b}\left(4a^2+b^2\right)^{3/2}\sqrt{\sqrt{4a^2+b^2}-b}\sqrt{-b\left(b+\sqrt{4a^2+b^2}\right)}\right)-\frac{a\left(\left(2a^2+b^2\right)\cosh(z)-ab\right)\sinh(z)}{\left(4a^2+b^2\right)\left(a\sinh^2(z)+b\cosh(z)\right)}\right)$$

Involving rational functions of coth

Involving $(a\coth(z)+b\operatorname{csch}(z))^{-n}$

01.23.21.0443.01

$$\int \frac{1}{a\coth(z)+b\operatorname{csch}(z)}\,dz = \frac{\log(b+a\cosh(z))}{a}$$

01.23.21.0444.01

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

Involving algebraic functions of the direct function and hyperbolic functions

Involving sinh

Involving $\sinh(c\,z)\left(a+b\operatorname{csch}^2(c\,z)\right)^{\beta}$

01.23.21.0445.01

$$\int \sinh(c\,z)\left(a+b\,\mathrm{csch}^2(c\,z)\right)^{\beta} dz = \frac{1}{2\,c\,(1-\beta)}\sqrt{\cosh^2(c\,z)}\,\left(b\,\mathrm{csch}^2(c\,z)+a\right)^{\beta} \sinh(c\,z)\left(\frac{a\sinh^2(c\,z)}{b}+1\right)^{-\beta}\tanh(c\,z)\,F_1\!\left(1-\beta;\frac{1}{2},-\beta;2-\beta;-\sinh^2(c\,z),-\frac{a\sinh^2(c\,z)}{b}\right)$$

01.23.21.0446.01

$$\int \sinh(c\,z)\sqrt{a+b\,\mathrm{csch}^2(c\,z)}\,dz = -\frac{i\sqrt{2}\sqrt{b\,\mathrm{csch}^2(c\,z)+a}\;E\!\left(i\,c\,z\,\middle|\,\frac{a}{b}\right)\sinh(c\,z)}{c\sqrt{\frac{\cosh(2\,c\,z)\,a-a+2\,b}{b}}}$$

01.23.21.0447.01

$$\int \frac{\sinh(c\,z)}{\sqrt{a+b\,\mathrm{csch}^2(c\,z)}}\,dz = -\frac{i\,b}{\sqrt{2}\,a\,c\sqrt{b\,\mathrm{csch}^2(c\,z)+a}}\sqrt{\frac{\cosh(2\,c\,z)\,a-a+2\,b}{b}}\;\mathrm{csch}(c\,z)\left(E\!\left(i\,c\,z\,\middle|\,\frac{a}{b}\right)-F\!\left(i\,c\,z\,\middle|\,\frac{a}{b}\right)\right)$$

Involving cosh

Involving $\cosh(c\,z)\left(a+b\,\mathrm{csch}^2(c\,z)\right)^{\beta}$

01.23.21.0448.01

$$\int \cosh(c\,z)\left(a+b\,\mathrm{csch}^2(c\,z)\right)^{\beta} dz = -\frac{\left(b\,\mathrm{csch}^2(c\,z)+a\right)^{\beta}\sinh(c\,z)\left(\frac{a\sinh^2(c\,z)}{b}+1\right)^{-\beta}}{2\,c\,\beta-c}\;{}_2F_1\!\left(\frac{1}{2}-\beta,-\beta;\frac{3}{2}-\beta;-\frac{a\sinh^2(c\,z)}{b}\right)$$

01.23.21.0449.01

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

01.23.21.0450.01

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

01.23.21.0451.01

$$\int \cosh(z)\,\mathrm{csch}^{n+1}(z)\left(\left(b\,\mathrm{csch}^n(z)+a\right)^{1/c}\right)^r dz = -\frac{\left(\left(b\,\mathrm{csch}^n(z)+a\right)^{1/c}\right)^r}{n}\left(\frac{b\,c\,\mathrm{csch}^n(z)}{b\,c+b\,r}+\frac{a\,c}{b\,(c+r)}\right)$$

Involving tanh

Involving $\tanh(c\,z)\left(a+b\,\mathrm{csch}^2(c\,z)\right)^{\beta}$

01.23.21.0452.01

$$\int \tanh(c\,z)\left(a+b\operatorname{csch}^2(c\,z)\right)^\beta dz = \frac{\left(b\operatorname{csch}^2(c\,z)+a\right)^\beta \sinh^2(c\,z)\left(\frac{a\sinh^2(c\,z)}{b}+1\right)^{-\beta}}{c\,(2-2\,\beta)} F_1\!\left(1-\beta;\,1,\,-\beta;\,2-\beta;\,-\sinh^2(c\,z),\,-\frac{a\sinh^2(c\,z)}{b}\right)$$

01.23.21.0453.01

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

01.23.21.0454.01

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

Involving coth

Involving $\coth(c\,z)\left(a+b\operatorname{csch}^2(c\,z)\right)^\beta$

01.23.21.0455.01

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

01.23.21.0456.01

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

01.23.21.0457.01

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

01.23.21.0458.01

$$\int \frac{\coth(z)}{\sqrt[4]{b\operatorname{csch}^2(z)+a}}\,dz = \frac{2\,{}_2F_1\!\left(\frac{1}{4},\,\frac{1}{4};\,\frac{5}{4};\,-\frac{a\sinh^2(z)}{b}\right)\sqrt[4]{\frac{a\sinh^2(z)}{b}+1}}{\sqrt[4]{b\operatorname{csch}^2(z)+a}}$$

Involving sinh and cosh

01.23.21.0459.01

$$\int \frac{(\cosh(2z)\sinh(z) - 2\cosh^3(z)(\sinh(z)-1))\operatorname{csch}^2(z)}{\sqrt{\sinh^2(z)-5}}\,dz = -\frac{\tan^{-1}\left(\frac{\sqrt{10}\cosh(z)}{\sqrt{\cosh(2z)-11}}\right)}{\sqrt{5}} - \frac{2\tan^{-1}\left(\frac{\sqrt{\cosh(2z)-11}}{\sqrt{10}}\right)}{\sqrt{5}} + 2\tanh^{-1}\left(\frac{\sqrt{2}\sinh(z)}{\sqrt{\cosh(2z)-11}}\right) + \frac{1}{5}\sqrt{2}\sqrt{\cosh(2z)-11}\operatorname{csch}(z) + 2\log\left(\sqrt{2}\cosh(z) + \sqrt{\cosh(2z)-11}\right) - \frac{2\sqrt{2}\sqrt{\cosh(2z)-11}\sqrt{\frac{\cosh(2z)-11}{(\cosh(z)+1)^2}}}{\sqrt{(\cosh(2z)-11)\operatorname{sech}^4\left(\frac{z}{2}\right)}}$$

Involving cosh and tanh

01.23.21.0460.01

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

01.23.21.0461.01

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

01.23.21.0462.01

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

01.23.21.0463.01

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

01.23.21.0464.01

$$\int \frac{\tanh^2(cz)\operatorname{csch}^2(cz)}{\sqrt{a+b\cosh(2cz)}}\,dz = \frac{1}{(a-b)\,c\sqrt{a+b\cosh(2cz)}}\left(\sqrt{\frac{a+b\cosh(2cz)}{a+b}}\,(a+b)\,i\,E\left(i\,cz\,\middle|\,\frac{2b}{a+b}\right) - i\,(a-b)\sqrt{\frac{a+b\cosh(2cz)}{a+b}}\,F\left(i\,cz\,\middle|\,\frac{2b}{a+b}\right) + (a+b\cosh(2cz))\tanh(cz)\right)$$

Involving cosh and coth

01.23.21.0465.01

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

01.23.21.0466.01

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

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 $z^n \sinh(a+b\,z)\operatorname{csch}^\nu(c\,z)$

01.23.21.0467.01

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

01.23.21.0468.01

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

01.23.21.0469.01

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

01.23.21.0470.01

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

Involving powers of sinh and power

Involving $z^n \sinh^u(b\,z)\operatorname{csch}^\nu(c\,z)$

01.23.21.0471.01

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

Involving cosh and power

Involving $z^n \cosh(a+b\,z)\operatorname{csch}^\nu(c\,z)$

01.23.21.0472.01

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

01.23.21.0473.01

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

01.23.21.0474.01

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

01.23.21.0475.01

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

Involving powers of cosh and power

Involving $z^n \cosh^u(b z) \operatorname{csch}^\nu(c z)$

01.23.21.0476.01

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

Involving powers of tanh and power

Involving $z^n \tanh^u(c z) \operatorname{csch}^\nu(c z)$

01.23.21.0477.01

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

Involving coth and power

Involving $z^n \coth(c z) \operatorname{csch}^\nu(c z)$

01.23.21.0478.01

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

01.23.21.0479.01

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

Involving powers of coth and power

Involving $z^n e^{p z} \coth^u(c z) \operatorname{csch}^\nu(c z)$

01.23.21.0480.01

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

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 $e^{p z} \sinh(b z) \operatorname{csch}^\nu(c z)$

01.23.21.0481.01

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

01.23.21.0482.01

$$\int e^{(b-c \nu) z} \sinh(b z) \operatorname{csch}^{\nu}(c z) \, dz = \frac{1}{2} \left(1 - e^{2 c z}\right)^{\nu} \operatorname{csch}^{\nu}(c z) \left(-e^{-c z \nu} z + \frac{e^{z (2 b - c \nu)} \, {}_2F_1\!\left(\frac{b}{c}, \nu; \frac{b}{c} + 1; e^{2 c z}\right)}{2 b} - \frac{e^{c z (2-\nu)} \, \nu \, {}_3F_2\!\left(1, 1, \nu + 1; 2, 2; e^{2 c z}\right)}{2 c} \right)$$

01.23.21.0483.01

$$\int e^{-(b+c \nu) z} \sinh(b z) \operatorname{csch}^{\nu}(c z) \, dz = \frac{1}{2} \left(1 - e^{2 c z}\right)^{\nu} \operatorname{csch}^{\nu}(c z) \left(e^{-c z \nu} z + \frac{e^{-z (2 b + c \nu)} \, {}_2F_1\!\left(-\frac{b}{c}, \nu; 1 - \frac{b}{c}; e^{2 c z}\right)}{2 b} + \frac{e^{c z (2-\nu)} \, \nu \, {}_3F_2\!\left(1, 1, \nu + 1; 2, 2; e^{2 c z}\right)}{2 c} \right)$$

Involving powers of sinh and exp

Involving $e^{p z} \sinh^{u}(b z) \operatorname{csch}^{\nu}(c z)$

01.23.21.0484.01

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

01.23.21.0485.01

$$\int e^{p z} \sinh^{\mu}(c z) \operatorname{csch}^{\nu}(c z) \, dz = \frac{e^{p z} \left(-e^{-c z} + e^{c z}\right)^{\mu - \nu} \left(2 - 2 e^{2 c z}\right)^{\nu - \mu} \operatorname{csch}^{\nu}(c z) \sinh^{\nu}(c z)}{p + c (\nu - \mu)} \, {}_2F_1\!\left(\frac{p - c \mu + c \nu}{2 c}, \nu - \mu; \frac{p + c (-\mu + \nu + 2)}{2 c}; e^{2 c z} \right)$$

01.23.21.0486.01

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

Involving cosh and exp

Involving $e^{pz}\cosh(bz)\operatorname{csch}^{\nu}(cz)$

01.23.21.0487.01

$$\int e^{pz}\cosh(bz)\operatorname{csch}^{\nu}(cz)\,dz = \frac{1}{2}\left(1-e^{2cz}\right)^{\nu}\operatorname{csch}^{\nu}(cz)\left(-\frac{e^{(p-b)z}}{b-p-c\nu}\,{}_2F_1\!\left(\frac{-b+p+c\nu}{2c},\nu;\frac{-b+p+c\nu}{2c}+1;e^{2cz}\right)+\frac{e^{(b+p)z}}{b+p+c\nu}\,{}_2F_1\!\left(\frac{b+p+c\nu}{2c},\nu;\frac{b+p+c\nu}{2c}+1;e^{2cz}\right)\right)/;\ p+b\neq -c\nu\land p-b\neq -c\nu$$

01.23.21.0488.01

$$\int e^{(b-c\nu)z}\cosh(bz)\operatorname{csch}^{\nu}(cz)\,dz = \frac{1}{2}\left(1-e^{2cz}\right)^{\nu}\operatorname{csch}^{\nu}(cz)\left(e^{-cz\nu}z+\frac{e^{z(2b-c\nu)}\,{}_2F_1\!\left(\frac{b}{c},\nu;\frac{b}{c}+1;e^{2cz}\right)}{2b}+\frac{e^{cz(2-\nu)}\,\nu\,{}_3F_2\!\left(1,1,\nu+1;2,2;e^{2cz}\right)}{2c}\right)$$

01.23.21.0489.01

$$\int e^{-(b+c\nu)z}\cosh(bz)\operatorname{csch}^{\nu}(cz)\,dz = \frac{1}{2}\left(1-e^{2cz}\right)^{\nu}\operatorname{csch}^{\nu}(cz)\left(e^{-cz\nu}z-\frac{e^{-z(2b+c\nu)}\,{}_2F_1\!\left(-\frac{b}{c},\nu;1-\frac{b}{c};e^{2cz}\right)}{2b}+\frac{e^{cz(2-\nu)}\,\nu\,{}_3F_2\!\left(1,1,\nu+1;2,2;e^{2cz}\right)}{2c}\right)$$

Involving powers of cosh and exp

Involving $e^{pz}\cosh^{u}(bz)\operatorname{csch}^{\nu}(cz)$

01.23.21.0490.01

$$\int e^{pz}\cosh^{u}(bz)\operatorname{csch}^{\nu}(cz)\,dz = \frac{2^{-u}e^{pz}\left(1-e^{2cz}\right)^{\nu}(1-u\bmod 2)\operatorname{csch}^{\nu}(cz)}{p+c\nu}\binom{u}{\frac{u}{2}}\,{}_2F_1\!\left(\frac{p+c\nu}{2c},\nu;\frac{p+c\nu}{2c}+1;e^{2cz}\right)+2^{-u}\left(1-e^{2cz}\right)^{\nu}\operatorname{csch}^{\nu}(cz)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{k}\left(\frac{e^{(p+b(u-2k))z}}{p+b(u-2k)+c\nu}\,{}_2F_1\!\left(\frac{p+b(u-2k)+c\nu}{2c},\nu;\frac{p+b(u-2k)+c\nu}{2c}+1;e^{2cz}\right)+\frac{e^{(p-b(u-2k))z}}{p-b(u-2k)+c\nu}\,{}_2F_1\!\left(\frac{p-b(u-2k)+c\nu}{2c},\nu;\frac{p-b(u-2k)+c\nu}{2c}+1;e^{2cz}\right)\right)/;\ u\in\mathbb{N}^{+}$$

01.23.21.0491.01

$$\int e^{pz}\cosh^{\mu}(cz)\operatorname{csch}^{\nu}(cz)\,dz = \frac{e^{pz}\left(1-e^{-2cz}\right)^{\nu}\left(1+e^{-2cz}\right)^{-\mu}\cosh^{\mu}(cz)\operatorname{csch}^{\nu}(cz)}{p+c(\mu-\nu)}\,F_1\!\left(-\frac{p+c\mu-c\nu}{2c};-\mu,\nu;\frac{c(-\mu+\nu+2)-p}{2c};-e^{-2cz},e^{-2cz}\right)$$

01.23.21.0492.01

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

Involving tanh and exp

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

01.23.21.0493.01

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

01.23.21.0494.01

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

Involving powers of tanh and exp

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

01.23.21.0495.01

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

01.23.21.0496.01

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

Involving coth and exp

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

01.23.21.0497.01

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

01.23.21.0498.01

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

01.23.21.0499.01

$$\int e^{-c \nu z} \coth(c z) \operatorname{csch}^{\nu}(c z) \, dz = \frac{1}{2 c \nu} \left(e^{-c z \nu} \operatorname{csch}^{\nu}(c z) \left(-2 c z \nu \left(1 - e^{2 c z}\right)^{\nu} - e^{2 c z} \nu (\nu + 1) \, {}_3F_2\left(1, 1, \nu + 2; 2, 2; e^{2 c z}\right) \left(1 - e^{2 c z}\right)^{\nu} + \left(1 - e^{2 c z}\right)^{\nu} - 1\right)\right)$$

01.23.21.0500.01

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

Involving powers of coth and exp

Involving $e^{pz}\coth^{\mu}(cz)\operatorname{csch}^{\nu}(cz)$

01.23.21.0501.01

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

01.23.21.0502.01

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

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 $\sin(az)\sinh(bz)\operatorname{csch}^{\nu}(cz)$

01.23.21.0503.01

$$\int \sin(az)\sinh(bz)\operatorname{csch}^{\nu}(cz)\,dz = \frac{1}{4}i\left(1-e^{2cz}\right)^{\nu}\operatorname{csch}^{\nu}(cz)\left(-\frac{e^{(b+ia)z}\,{}_2F_1\left(\frac{b}{2c}+\frac{ia}{2c}+\frac{\nu}{2},\nu;\frac{b}{2c}+\frac{ia}{2c}+\frac{\nu}{2}+1;e^{2cz}\right)}{b+ia+c\nu}+\frac{e^{(b-ia)z}\,{}_2F_1\left(\frac{b}{2c}+\frac{\nu}{2}-\frac{ia}{2c},\nu;\frac{b}{2c}+\frac{\nu}{2}-\frac{ia}{2c}+1;e^{2cz}\right)}{b-ia+c\nu}+\frac{e^{(ia-b)z}\,{}_2F_1\left(-\frac{b}{2c}+\frac{ia}{2c}+\frac{\nu}{2},\nu;-\frac{b}{2c}+\frac{ia}{2c}+\frac{\nu}{2}+1;e^{2cz}\right)}{-b+ia+c\nu}-\frac{e^{(-b-ia)z}\,{}_2F_1\left(-\frac{b}{2c}+\frac{\nu}{2}-\frac{ia}{2c},\nu;-\frac{b}{2c}+\frac{\nu}{2}-\frac{ia}{2c}+1;e^{2cz}\right)}{-b-ia+c\nu}\right)$$

Involving powers of sin and powers of sinh

Involving $\sin^{m}(az)\sinh^{u}(bz)\operatorname{csch}^{\nu}(cz)$

01.23.21.0504.01

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

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

$$\left.\frac{(-1)^m e^{i a (m-2s) z}\,{}_2F_1\left(\frac{i a m}{2c}+\frac{\nu}{2}-\frac{i a s}{c},\nu;\frac{i a m}{2c}+\frac{\nu}{2}-\frac{i a s}{c}+1;e^{2cz}\right)}{a\,i\,(m-2s)+c\,\nu}\right) +$$

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

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

$$2^{-m-u}\left(1-e^{2cz}\right)^\nu\operatorname{csch}^\nu(c z)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^{k+s}\binom{m}{s}\binom{u}{k}\left(\left(e^{\frac{i\pi m}{2}+(b(u-2k)-i a(m-2s))z}\,{}_2F_1\left(-\frac{b k}{c}+\frac{i a s}{c}+\frac{b u}{2c}+\frac{\nu}{2}-\frac{i a m}{2c},\right.\right.\right.$$

$$\left.\left.\nu;-\frac{b k}{c}+\frac{i a s}{c}+\frac{b u}{2c}+\frac{\nu}{2}-\frac{i a m}{2c}+1;e^{2cz}\right)\right)\Big/(-i\,a\,(m-2s)+b(u-2k)+c\,\nu)+$$

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

$$(a\,i\,(m-2s)+b(u-2k)+c\,\nu)+\left((-1)^u e^{\frac{i\pi m}{2}+(-i a(m-2s)-b(u-2k))z}\right.$$

$$\left.{}_2F_1\left(\frac{b k}{c}+\frac{i a s}{c}+\frac{\nu}{2}-\frac{i a m}{2c}-\frac{b u}{2c},\nu;\frac{b k}{c}+\frac{i a s}{c}+\frac{\nu}{2}-\frac{i a m}{2c}-\frac{b u}{2c}+1;e^{2cz}\right)\right)\Big/$$

$$(-i\,a\,(m-2s)-b(u-2k)+c\,\nu)+\left((-1)^u e^{(i a(m-2s)-b(u-2k))z-\frac{i m\pi}{2}}\,{}_2F_1\left(\frac{b k}{c}+\frac{i a m}{2c}+\frac{\nu}{2}-\frac{i a s}{c}-\frac{b u}{2c},\right.\right.$$

$$\left.\left.\left.\nu;\frac{b k}{c}+\frac{i a m}{2c}+\frac{\nu}{2}-\frac{i a s}{c}-\frac{b u}{2c}+1;e^{2cz}\right)\right)\Big/(a\,i\,(m-2s)-b(u-2k)+c\,\nu)\right)\;/;\; m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

01.23.21.0505.01

$$\int \sin^m(a z)\sinh^\mu(c z)\operatorname{csch}^\nu(c z)\,dz = 2^{-m}\sinh^\mu(c z)\left(1-e^{2cz}\right)^{\nu-\mu}\operatorname{csch}^\nu(c z)$$
$$\left(\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(\frac{e^{\frac{i\pi m}{2}+a i(2k-m)z}}{a i(2k-m)+c(\nu-\mu)}\,{}_2F_1\!\left(\frac{a i(2k-m)-c\mu+c\nu}{2c},\nu-\mu;\frac{a i(2k-m)+c(-\mu+\nu+2)}{2c};e^{2cz}\right)+\right.\right.$$
$$\left.\left.\frac{e^{i a(m-2k)z-\frac{i m\pi}{2}}}{a i(m-2k)+c(\nu-\mu)}\,{}_2F_1\!\left(\frac{a i(m-2k)-c\mu+c\nu}{2c},\nu-\mu;\frac{a i(m-2k)+c(-\mu+\nu+2)}{2c};e^{2cz}\right)\right)\right)+$$
$$\frac{2^{-m}\sinh^\mu(c z)\left(1-e^{2cz}\right)^{\nu-\mu}}{c(\nu-\mu)}\binom{m}{\frac{m}{2}}\operatorname{csch}^\nu(c z)\,{}_2F_1\!\left(\frac{c\nu-c\mu}{2c},\nu-\mu;\frac{1}{2}(-\mu+\nu+2);e^{2cz}\right)(1-m\bmod 2)\;/;\;m\in\mathbb{N}^+$$

Involving cos and sinh

Involving $\cos(a z)\sinh(b z)\operatorname{csch}^\nu(c z)$

01.23.21.0506.01

$$\int\cos(a z)\sinh(b z)\operatorname{csch}^\nu(c z)\,dz = \frac{2^{\nu-2}e^{z(b+i a-c\nu)}\left(e^{-i a z}+e^{i a z}\right)\left(-e^{-b z}+e^{b z}\right)\left(1-e^{2cz}\right)^\nu}{\left(1+e^{2 i a z}\right)\left(-1+e^{2bz}\right)}$$
$$\left(\frac{e^{cz}}{-1+e^{2cz}}\right)^\nu\left(\frac{e^{z(-b+i a+c\nu)}}{b-i a-c\nu}\,{}_2F_1\!\left(\frac{-b+i a+c\nu}{2c},\nu;\frac{-b+i a+c(\nu+2)}{2c};e^{2cz}\right)+\right.$$
$$i\left(\frac{e^{z(b-i a+c\nu)}}{a+i(b+c\nu)}\,{}_2F_1\!\left(\frac{b-i a+c\nu}{2c},\nu;\frac{b-i a+c(\nu+2)}{2c};e^{2cz}\right)-\right.$$
$$\left.\frac{e^{z(b+i a+c\nu)}}{a-i(b+c\nu)}\,{}_2F_1\!\left(\frac{b+i a+c\nu}{2c},\nu;\frac{b+i a+c(\nu+2)}{2c};e^{2cz}\right)\right)+$$
$$\left.\frac{e^{z(-b-i a+c\nu)}}{b+i a-c\nu}\,{}_2F_1\!\left(-\frac{b+i a-c\nu}{2c},\nu;-\frac{b+i a-c(\nu+2)}{2c};e^{2cz}\right)\right)$$

Involving powers of cos and powers of sinh

Involving $\cos^m(a z)\sinh^u(b z)\operatorname{csch}^\nu(c z)$

01.23.21.0507.01

$$\int \cos^m(a z) \sinh^u(b z) \operatorname{csch}^\nu(c z)\, dz = \frac{i^u 2^{-m-u} \left(1-e^{2cz}\right)^\nu \operatorname{csch}^\nu(cz)(1-m \bmod 2)(1-u \bmod 2)}{c\nu} \binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}} {}_2F_1\left(\frac{\nu}{2}, \nu; \frac{\nu}{2}+1; e^{2cz}\right) + i^u 2^{-m-u}\left(1-e^{2cz}\right)^\nu \binom{u}{\frac{u}{2}} \operatorname{csch}^\nu(cz)(1-u \bmod 2) \sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor} \binom{m}{s} \left(\frac{e^{-i a(m-2s)z}\, {}_2F_1\left(-\frac{iam}{2c}+\frac{ias}{c}+\frac{\nu}{2}, \nu; -\frac{iam}{2c}+\frac{ias}{c}+\frac{\nu}{2}+1; e^{2cz}\right)}{c\nu - i a(m-2s)} + \frac{e^{i a(m-2s)z}\, {}_2F_1\left(\frac{iam}{2c}+\frac{\nu}{2}-\frac{ias}{c}, \nu; \frac{iam}{2c}+\frac{\nu}{2}-\frac{ias}{c}+1; e^{2cz}\right)}{a i(m-2s)+c\nu}\right) +$$

$$2^{-m-u}\left(1-e^{2cz}\right)^\nu \binom{m}{\frac{m}{2}} \operatorname{csch}^\nu(cz)(1-m \bmod 2) \sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor} (-1)^k \binom{u}{k} \left(\frac{e^{b(u-2k)z}\, {}_2F_1\left(-\frac{bk}{c}+\frac{bu}{2c}+\frac{\nu}{2}, \nu; -\frac{bk}{c}+\frac{bu}{2c}+\frac{\nu}{2}+1; e^{2cz}\right)}{b(u-2k)+c\nu} + \frac{(-1)^u e^{-b(u-2k)z}\, {}_2F_1\left(\frac{bk}{c}+\frac{\nu}{2}-\frac{bu}{2c}, \nu; \frac{bk}{c}+\frac{\nu}{2}-\frac{bu}{2c}+1; e^{2cz}\right)}{c\nu - b(u-2k)}\right) +$$

$$2^{-m-u}\left(1-e^{2cz}\right)^\nu \operatorname{csch}^\nu(cz) \sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor} \sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor} (-1)^k \binom{m}{s}\binom{u}{k} \left(\left(e^{(b(u-2k)-ia(m-2s))z}\, {}_2F_1\left(-\frac{bk}{c}+\frac{ias}{c}+\frac{bu}{2c}+\frac{\nu}{2}-\frac{iam}{2c}, \nu; -\frac{bk}{c}+\frac{ias}{c}+\frac{bu}{2c}+\frac{\nu}{2}-\frac{iam}{2c}+1; e^{2cz}\right)\right) \Big/ (-ia(m-2s)+b(u-2k)+c\nu) + \left(e^{(ai(m-2s)+b(u-2k))z}\, {}_2F_1\left(-\frac{bk}{c}+\frac{iam}{2c}+\frac{bu}{2c}+\frac{\nu}{2}-\frac{ias}{c}, \nu; -\frac{bk}{c}+\frac{iam}{2c}+\frac{bu}{2c}+\frac{\nu}{2}-\frac{ias}{c}+1; e^{2cz}\right)\right) \Big/ (ai(m-2s)+b(u-2k)+c\nu) + \left((-1)^u e^{(-ia(m-2s)-b(u-2k))z}\, {}_2F_1\left(\frac{bk}{c}+\frac{ias}{c}+\frac{\nu}{2}-\frac{iam}{2c}-\frac{bu}{2c}, \nu; \frac{bk}{c}+\frac{ias}{c}+\frac{\nu}{2}-\frac{iam}{2c}-\frac{bu}{2c}+1; e^{2cz}\right)\right) \Big/ (-ia(m-2s)-b(u-2k)+c\nu) + \left((-1)^u e^{(ia(m-2s)-b(u-2k))z}\, {}_2F_1\left(\frac{bk}{c}+\frac{iam}{2c}+\frac{\nu}{2}-\frac{ias}{c}-\frac{bu}{2c}, \nu; \frac{bk}{c}+\frac{iam}{2c}+\frac{\nu}{2}-\frac{ias}{c}-\frac{bu}{2c}+1; e^{2cz}\right)\right) \Big/ (ai(m-2s)-b(u-2k)+c\nu)\right) /;\ m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

01.23.21.0508.01

$$\int \cos^m(a z)\sinh^\mu(c z)\operatorname{csch}^\nu(c z)\,dz = 2^{-m-\mu}\left(1-e^{2cz}\right)^{\nu-\mu}\operatorname{csch}^\nu(c z)\left(\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\left(\frac{e^{i a(2k-m)z}\,{}_2F_1\left(\frac{a i(2k-m)-c\mu+c\nu}{2c}, \nu-\mu; \frac{a i(2k-m)+c(-\mu+\nu+2)}{2c}; e^{2cz}\right)}{a i(2k-m)+c(\nu-\mu)} + \frac{e^{i a(m-2k)z}\,{}_2F_1\left(\frac{a i(m-2k)-c\mu+c\nu}{2c}, \nu-\mu; \frac{a i(m-2k)+c(-\mu+\nu+2)}{2c}; e^{2cz}\right)}{a i(m-2k)+c(\nu-\mu)}\right)\right)\left(-e^{-cz}+e^{cz}\right)^\mu + \frac{1}{c(\nu-\mu)}\left(2^{-m-\mu}\left(-e^{-cz}+e^{cz}\right)^\mu\left(1-e^{2cz}\right)^{\nu-\mu}\binom{m}{\frac{m}{2}}\operatorname{csch}^\nu(c z)\,{}_2F_1\left(\frac{c\nu-c\mu}{2c}, \nu-\mu; \frac{1}{2}(-\mu+\nu+2); e^{2cz}\right)(1-m \bmod 2)\right) /; m\in\mathbb{N}^+$$

Involving sin and cosh

Involving $\sin(a z)\cosh(b z)\operatorname{csch}^\nu(c z)$

01.23.21.0509.01

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

Involving powers of sin and powers of cosh

Involving $\sin^m(a z)\cosh^u(b z)\operatorname{csch}^\nu(c z)$

01.23.21.0510.01

$$\int \sin^m(a z)\cosh^u(b z)\operatorname{csch}^\nu(c z)\,dz = 2^{-m-u}\left(1-e^{2cz}\right)^\nu \binom{u}{\frac{u}{2}}(1-u \bmod 2)\operatorname{csch}^\nu(c z)$$

$$\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^s\binom{m}{s}\left(\frac{e^{\frac{i m\pi}{2}-i a(m-2s)z}}{c\nu - i a(m-2s)}\,{}_2F_1\!\left(-\frac{i a m}{2c}+\frac{i a s}{c}+\frac{\nu}{2},\nu;-\frac{i a m}{2c}+\frac{i a s}{c}+\frac{\nu}{2}+1;e^{2cz}\right)+\right.$$

$$\left.\frac{e^{i a(m-2s)z-\frac{i m\pi}{2}}}{a i(m-2s)+c\nu}\,{}_2F_1\!\left(\frac{i a m}{2c}+\frac{\nu}{2}-\frac{i a s}{c},\nu;\frac{i a m}{2c}+\frac{\nu}{2}-\frac{i a s}{c}+1;e^{2cz}\right)\right)+2^{-m-u}\left(1-e^{2cz}\right)^\nu\binom{m}{\frac{m}{2}}$$

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

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

$$2^{-m-u}\left(1-e^{2cz}\right)^\nu\operatorname{csch}^\nu(c z)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^s\binom{m}{s}\binom{u}{k}\left(\frac{e^{\frac{i\pi m}{2}+(b(u-2k)-i a(m-2s))z}}{-i a(m-2s)+b(u-2k)+c\nu}\right.$$

$${}_2F_1\!\left(-\frac{b k}{c}+\frac{i a s}{c}+\frac{b u}{2c}+\frac{\nu}{2}-\frac{i a m}{2c},\nu;-\frac{b k}{c}+\frac{i a s}{c}+\frac{b u}{2c}+\frac{\nu}{2}-\frac{i a m}{2c}+1;e^{2cz}\right)+$$

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

$$\left.e^{2cz}\right)+\frac{e^{\frac{i\pi m}{2}+(-i a(m-2s)-b(u-2k))z}}{-i a(m-2s)-b(u-2k)+c\nu}\,{}_2F_1\!\left(\frac{b k}{c}+\frac{i a s}{c}+\frac{\nu}{2}-\frac{i a m}{2c}-\frac{b u}{2c},\right.$$

$$\left.\nu;\frac{b k}{c}+\frac{i a s}{c}+\frac{\nu}{2}-\frac{i a m}{2c}-\frac{b u}{2c}+1;e^{2cz}\right)+\frac{e^{(i a(m-2s)-b(u-2k))z-\frac{i m\pi}{2}}}{a i(m-2s)-b(u-2k)+c\nu}$$

$$\left.{}_2F_1\!\left(\frac{b k}{c}+\frac{i a m}{2c}+\frac{\nu}{2}-\frac{i a s}{c}-\frac{b u}{2c},\nu;\frac{b k}{c}+\frac{i a m}{2c}+\frac{\nu}{2}-\frac{i a s}{c}-\frac{b u}{2c}+1;e^{2cz}\right)\right)+$$

$$\frac{2^{-m-u}\left(1-e^{2cz}\right)^\nu(1-m \bmod 2)(1-u \bmod 2)}{c\nu}\binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}\operatorname{csch}^\nu(c z)\,{}_2F_1\!\left(\frac{\nu}{2},\nu;\frac{\nu}{2}+1;e^{2cz}\right)\ /;\ m\in \mathbb{N}^+\bigwedge u\in \mathbb{N}^+$$

01.23.21.0511.01

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

Involving cos and cosh

Involving $\cos(a z)\cosh(b z)\operatorname{csch}^\nu(c z)$

01.23.21.0512.01

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

Involving powers of cos and powers of cosh

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

01.23.21.0513.01

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

01.23.21.0514.01

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

Involving sin and tanh

Involving $\sin(a z) \tanh(c z) \operatorname{csch}^\nu(c z)$

01.23.21.0515.01

$$\int \sin(a z) \tanh(c z) \operatorname{csch}^\nu(c z)\, dz = \frac{1}{2} i \left(1 - e^{-2 c z}\right)^\nu \operatorname{csch}^\nu(c z) \left(\frac{e^{-i a z} F_1\left(\frac{i a + c \nu}{2c}; 1, \nu-1; \frac{1}{2}\left(2 + \frac{i a}{c} + \nu\right); -e^{-2 c z}, e^{-2 c z}\right)}{-i a - c \nu} + \frac{e^{i a z} F_1\left(-\frac{i a - c \nu}{2c}; 1, \nu-1; \frac{1}{2}\left(2 - \frac{i a}{c} + \nu\right); -e^{-2 c z}, e^{-2 c z}\right)}{-i a + c \nu} \right)$$

Involving powers of sin and powers of tanh

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

01.23.21.0516.01

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

Involving cos and tanh

Involving $\cos(a\,z)\tanh(c\,z)\operatorname{csch}^{\nu}(c\,z)$

01.23.21.0517.01

$$\int \cos(a\,z)\tanh(c\,z)\operatorname{csch}^{\nu}(c\,z)\,dz = \frac{1}{2}\left(1-e^{-2cz}\right)^{\nu}\operatorname{csch}^{\nu}(c\,z)\left(\frac{e^{-iaz}F_1\left(-\frac{-ia-c\nu}{2c};1,\nu-1;\frac{1}{2}\left(2+\frac{ia}{c}+\nu\right);-e^{-2cz},e^{-2cz}\right)}{-ia-c\nu}+\frac{e^{iaz}F_1\left(-\frac{ia-c\nu}{2c};1,\nu-1;\frac{1}{2}\left(2-\frac{ia}{c}+\nu\right);-e^{-2cz},e^{-2cz}\right)}{ia-c\nu}\right)$$

Involving powers of cos and powers of tanh

Involving $\cos^m(a\,z)\tanh^{\mu}(c\,z)\operatorname{csch}^{\nu}(c\,z)$

01.23.21.0518.01

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

Involving sin and coth

Involving $\sin(a\,z)\coth(c\,z)\operatorname{csch}^{\nu}(c\,z)$

01.23.21.0519.01

$$\int \sin(a\,z)\coth(c\,z)\operatorname{csch}^{\nu}(c\,z)\,dz = \frac{1}{2}\left(1-e^{-2cz}\right)^{\nu}\operatorname{csch}^{\nu}(c\,z)\left(\frac{e^{\frac{i\pi}{2}-iaz}F_1\left(-\frac{-ia-c\nu}{2c};-1,\nu+1;\frac{1}{2}\left(2+\frac{ia}{c}+\nu\right);-e^{-2cz},e^{-2cz}\right)}{-ia-c\nu}+\right.$$
$$\left.\frac{e^{-\frac{1}{2}(i\pi)+iaz}F_1\left(-\frac{ia-c\nu}{2c};-1,\nu+1;\frac{1}{2}\left(2-\frac{ia}{c}+\nu\right);-e^{-2cz},e^{-2cz}\right)}{ia-c\nu}\right)$$

Involving powers of sin and powers of coth

Involving $\sin^m(a\,z)\coth^{\mu}(c\,z)\operatorname{csch}^{\nu}(c\,z)$

01.23.21.0520.01

$$\int \sin^m(a z) \coth^\mu(c z) \operatorname{csch}^\nu(c z) \, dz = 2^{-m} \left(1 - e^{-2 c z}\right)^{\mu+\nu} \left(1 + e^{-2 c z}\right)^{-\mu} \coth^\mu(c z) \operatorname{csch}^\nu(c z)$$

$$\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left(\frac{e^{\frac{i \pi m}{2} + a i (2k-m) z} F_1\left(-\frac{i a (2k-m) - c \nu}{2c}; -\mu, \mu+\nu; \frac{1}{2}\left(-\frac{i a (2k-m)}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)}{i a (2k-m) - c \nu} + \frac{1}{i a (m-2k) - c \nu} \right.$$

$$\left. \left(e^{i a (m-2k) z - \frac{i m \pi}{2}} F_1\left(-\frac{i a (m-2k) - c \nu}{2c}; -\mu, \mu+\nu; \frac{1}{2}\left(-\frac{i a (m-2k)}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)\right) \right) -$$

$$\frac{1}{c \nu} \left(2^{-m} \left(1 - e^{-2 c z}\right)^{\mu+\nu} \left(1 + e^{-2 c z}\right)^{-\mu} F_1\left(\frac{\nu}{2}; -\mu, \mu+\nu; \frac{\nu+2}{2}; -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} \coth^\mu(c z)\right.$$

$$\left. \operatorname{csch}^\nu(c z) (1 - m \bmod 2) \right) /; m \in \mathbb{N}^+$$

01.23.21.0521.01

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

Involving cos and coth

Involving $\cos(a z)\coth(c z)\operatorname{csch}^\nu(c z)$

01.23.21.0522.01

$$\int \cos(a z)\coth(c z)\operatorname{csch}^\nu(c z)\,dz = \frac{1}{2}\left(1-e^{-2cz}\right)^\nu\operatorname{csch}^\nu(c z) \left(\frac{e^{-i a z}F_1\left(-\frac{-i a-c\nu}{2c}; -1, \nu+1; \frac{1}{2}\left(2+\frac{i a}{c}+\nu\right); -e^{-2cz}, e^{-2cz}\right)}{-i a-c\nu}+\frac{e^{i a z}F_1\left(-\frac{i a-c\nu}{2c}; -1, \nu+1; \frac{1}{2}\left(2-\frac{i a}{c}+\nu\right); -e^{-2cz}, e^{-2cz}\right)}{i a-c\nu}\right)$$

Involving powers of cos and powers of coth

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

01.23.21.0523.01

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

01.23.21.0524.01

$$\int \cos^m(a z)\coth^u(c z)\operatorname{csch}^\nu(c z)\,dz = 2^{-m-u}\left(1-e^{2cz}\right)^{u+\nu}\binom{u}{\frac{u}{2}}(1-u \bmod 2)\operatorname{csch}^{u+\nu}(c z) \sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(\frac{e^{-i a (m-2s) z}\,{}_2F_1\left(-\frac{i a m}{2c}+\frac{i a s}{c}+\frac{u}{2}+\frac{\nu}{2},\, u+\nu;\, -\frac{i a m}{2c}+\frac{i a s}{c}+\frac{u}{2}+\frac{\nu}{2}+1;\, e^{2cz}\right)}{c(u+\nu)-i a(m-2s)}+\frac{e^{i a (m-2s) z}\,{}_2F_1\left(\frac{i a m}{2c}+\frac{u}{2}+\frac{\nu}{2}-\frac{i a s}{c},\, u+\nu;\, \frac{i a m}{2c}+\frac{u}{2}+\frac{\nu}{2}-\frac{i a s}{c}+1;\, e^{2cz}\right)}{a i (m-2s)+c(u+\nu)}\right)+$$

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

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

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 $z^n\, e^{p z} \sinh(a+b z)\operatorname{csch}^\nu(c z)$

01.23.21.0525.01

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

01.23.21.0526.01

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

01.23.21.0527.01

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

01.23.21.0528.01

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

01.23.21.0529.01

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

01.23.21.0530.01

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

Involving powers of sinh, exp and power

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

01.23.21.0531.01

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

Involving cosh, exp and power

Involving $z^n e^{pz} \cosh(a+bz)\operatorname{csch}^\nu(cz)$

01.23.21.0532.01

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

01.23.21.0533.01

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

01.23.21.0534.01

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

01.23.21.0535.01

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

01.23.21.0536.01

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

01.23.21.0537.01

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

Involving powers of cosh, exp and power

Involving $z^n e^{pz}\cosh^u(bz)\,\text{csch}^\nu(cz)$

01.23.21.0538.01

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

Involving powers of tanh, exp and power

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

01.23.21.0539.01

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

Involving coth, exp and power

Involving $z^n e^{pz} \coth(cz) \operatorname{csch}^\nu(cz)$

01.23.21.0540.01

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

01.23.21.0541.01

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

Involving powers of coth, exp and power

Involving $z^n e^{pz} \coth^u(cz) \operatorname{csch}^\nu(cz)$

01.23.21.0542.01

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

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 $e^{pz}\sin(az)\sinh(bz)\operatorname{csch}^\nu(cz)$

01.23.21.0543.01

$$\int e^{pz}\sin(az)\sinh(bz)\operatorname{csch}^\nu(cz)\,dz = \frac{1}{4}\,i\left(1-e^{2cz}\right)^\nu\operatorname{csch}^\nu(cz)\left(\frac{e^{(-b+ia+p)z}\,{}_2F_1\left(\frac{-b+ia+p+c\nu}{2c},\nu;\frac{-b+ia+p+c\nu}{2c}+1;e^{2cz}\right)}{-b+ia+p+c\nu}-\frac{e^{(-b-ia+p)z}\,{}_2F_1\left(\frac{-b-ia+p+c\nu}{2c},\nu;\frac{-b-ia+p+c\nu}{2c}+1;e^{2cz}\right)}{-b-ia+p+c\nu}-\frac{e^{(b+ia+p)z}\,{}_2F_1\left(\frac{b+ia+p+c\nu}{2c},\nu;\frac{b+ia+p+c\nu}{2c}+1;e^{2cz}\right)}{b+ia+p+c\nu}+\frac{e^{(b-ia+p)z}\,{}_2F_1\left(\frac{b-ia+p+c\nu}{2c},\nu;\frac{b-ia+p+c\nu}{2c}+1;e^{2cz}\right)}{b-ia+p+c\nu}\right)$$

Involving powers of sin, powers of sinh and exp

Involving $e^{pz}\sin^m(az)\sinh^u(bz)\operatorname{csch}^\nu(cz)$

01.23.21.0544.01

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

01.23.21.0545.01

$$\int e^{pz}\sin^m(az)\sinh^\mu(cz)\operatorname{csch}^\nu(cz)\,dz = \frac{1}{p+c(\nu-\mu)} e^{pz}\left(1-e^{2cz}\right)^{\nu-\mu} 2^{-m-\mu}\binom{m}{\frac{m}{2}}(1-m \bmod 2)\left(-e^{-cz}+e^{cz}\right)^\mu \operatorname{csch}^\nu(cz)\,{}_2F_1\!\left(\frac{p-c\mu+c\nu}{2c},\nu-\mu;\frac{p+c(-\mu+\nu+2)}{2c};e^{2cz}\right) + 2^{-m-\mu}\left(1-e^{2cz}\right)^{\nu-\mu}\operatorname{csch}^\nu(cz)\left(-e^{-cz}+e^{cz}\right)^\mu \sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\left(\frac{e^{\frac{i\pi m}{2}+(ai(2k-m)+p)z}\,{}_2F_1\!\left(\frac{ai(2k-m)+p-c\mu+c\nu}{2c},\nu-\mu;\frac{ai(2k-m)+p+c(-\mu+\nu+2)}{2c};e^{2cz}\right)}{ai(2k-m)+p+c(\nu-\mu)} + \frac{e^{(ai(m-2k)+p)z-\frac{im\pi}{2}}\,{}_2F_1\!\left(\frac{ai(m-2k)+p-c\mu+c\nu}{2c},\nu-\mu;\frac{ai(m-2k)+p+c(-\mu+\nu+2)}{2c};e^{2cz}\right)}{ai(m-2k)+p+c(\nu-\mu)}\right) /;\ m\in\mathbb{N}^+$$

Involving cos, sinh and exp

Involving $e^{pz}\cos(az)\sinh(bz)\operatorname{csch}^\nu(cz)$

01.23.21.0546.01

$$\int e^{pz}\cos(az)\sinh(bz)\operatorname{csch}^\nu(cz)\,dz = \frac{2^{\nu-2}e^{z(b+ia-c\nu)}\left(e^{-iaz}+e^{iaz}\right)\left(-e^{-bz}+e^{bz}\right)\left(1-e^{2cz}\right)^\nu}{\left(1+e^{2iaz}\right)\left(-1+e^{2bz}\right)} \left(\frac{e^{cz}}{-1+e^{2cz}}\right)^\nu \left(i\left(\frac{e^{z(b-ia+p+c\nu)}}{a+i(b+p+c\nu)}\,{}_2F_1\!\left(\frac{b-ia+p+c\nu}{2c},\nu;\frac{b+2c-ia+p+c\nu}{2c};e^{2cz}\right) - \frac{e^{z(b+ia+p+c\nu)}}{a-i(b+p+c\nu)}\,{}_2F_1\!\left(\frac{b+ia+p+c\nu}{2c},\nu;\frac{b+2c+ia+p+c\nu}{2c};e^{2cz}\right)\right) + \frac{e^{z(-b-ia+p+c\nu)}}{b+ia-p-c\nu}\,{}_2F_1\!\left(\frac{-b-ia+p+c\nu}{2c},\nu;\frac{-b+2c-ia+p+c\nu}{2c};e^{2cz}\right) - \frac{e^{z(-b+ia+p+c\nu)}}{-b+ia+p+c\nu}\,{}_2F_1\!\left(\frac{-b+ia+p+c\nu}{2c},\nu;\frac{-b+2c+ia+p+c\nu}{2c};e^{2cz}\right)\right)$$

Involving powers of cos, powers of sinh and exp

Involving $e^{pz}\cos^m(az)\sinh^u(bz)\operatorname{csch}^\nu(cz)$

01.23.21.0547.01

$$\int e^{pz}\cos^m(az)\sinh^u(bz)\operatorname{csch}^\nu(cz)\,dz = \frac{1}{p+c\nu}\left(i^u 2^{-m-u} e^{pz}\left(1-e^{2cz}\right)^\nu \binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}\operatorname{csch}^\nu(cz)\,{}_2F_1\!\left(\frac{p+c\nu}{2c},\nu;\frac{p+c\nu}{2c}+1;e^{2cz}\right)(1-m\bmod 2)(1-u\bmod 2)\right)+$$
$$i^u 2^{-m-u}\left(1-e^{2cz}\right)^\nu\binom{u}{\frac{u}{2}}\operatorname{csch}^\nu(cz)(1-u\bmod 2)\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{s}\left(\frac{e^{(p-ia(m-2s))z}\,{}_2F_1\!\left(\frac{p-ia(m-2s)+c\nu}{2c},\nu;\frac{p-ia(m-2s)+c\nu}{2c}+1;e^{2cz}\right)}{p-ia(m-2s)+c\nu}+\right.$$
$$\left.\frac{e^{(p+ai(m-2s))z}\,{}_2F_1\!\left(\frac{p+ai(m-2s)+c\nu}{2c},\nu;\frac{p+ai(m-2s)+c\nu}{2c}+1;e^{2cz}\right)}{p+ai(m-2s)+c\nu}\right)+2^{-m-u}\left(1-e^{2cz}\right)^\nu\binom{m}{\frac{m}{2}}\operatorname{csch}^\nu(cz)$$
$$(1-m\bmod 2)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\left(\frac{(-1)^u e^{(p-b(u-2k))z}\,{}_2F_1\!\left(\frac{-b(u-2k)+p+c\nu}{2c},\nu;\frac{-b(u-2k)+p+c\nu}{2c}+1;e^{2cz}\right)}{p-b(u-2k)+c\nu}+\right.$$
$$\left.\frac{e^{(p+b(u-2k))z}\,{}_2F_1\!\left(\frac{b(u-2k)+p+c\nu}{2c},\nu;\frac{b(u-2k)+p+c\nu}{2c}+1;e^{2cz}\right)}{p+b(u-2k)+c\nu}\right)+2^{-m-u}\left(1-e^{2cz}\right)^\nu\operatorname{csch}^\nu(cz)\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{s}\binom{u}{k}$$
$$\left(\left((-1)^u\left(e^{(p-ia(m-2s)-b(u-2k))z}\,{}_2F_1\!\left(\frac{p-ia(m-2s)-b(u-2k)+c\nu}{2c},\nu;\frac{p-ia(m-2s)-b(u-2k)+c\nu}{2c}+1;\right.\right.\right.\right.$$
$$\left.\left.\left.e^{2cz}\right)\right)\right)\Big/(p-ia(m-2s)-b(u-2k)+c\nu)+\left((-1)^u e^{(p+ai(m-2s)-b(u-2k))z}\right.$$
$$\left.{}_2F_1\!\left(\frac{-b(u-2k)+p+ai(m-2s)+c\nu}{2c},\nu;\frac{-b(u-2k)+p+ai(m-2s)+c\nu}{2c}+1;e^{2cz}\right)\right)\Big/$$
$$(p+ai(m-2s)-b(u-2k)+c\nu)+\left(e^{(p+ai(m-2s)+b(u-2k))z}\,{}_2F_1\!\left(\frac{p+ai(m-2s)+b(u-2k)+c\nu}{2c},\right.\right.$$
$$\left.\left.\nu;\frac{p+ai(m-2s)+b(u-2k)+c\nu}{2c}+1;e^{2cz}\right)\right)\Big/(p+ai(m-2s)+b(u-2k)+c\nu)+$$
$$\left(e^{(p-ia(m-2s)+b(u-2k))z}\,{}_2F_1\!\left(\frac{p-ia(m-2s)+b(u-2k)+c\nu}{2c},\nu;\frac{p-ia(m-2s)+b(u-2k)+c\nu}{2c}+1;\right.\right.$$
$$\left.\left.\left.e^{2cz}\right)\right)\Big/(p-ia(m-2s)+b(u-2k)+c\nu)\right)\;/;\;m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

01.23.21.0548.01

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

Involving sin, cosh and exp

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

01.23.21.0549.01

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

Involving powers of sin, powers of cosh and exp

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

01.23.21.0550.01

$$\int e^{p z} \sin^m(a z) \cosh^u(b z) \operatorname{csch}^\nu(c z)\, dz = 2^{-m-u} \left(1 - e^{2 c z}\right)^\nu \binom{u}{\frac{u}{2}} (1 - u \bmod 2)$$

$$\operatorname{csch}^\nu(c z) \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^s \binom{m}{s} \left(\frac{e^{\frac{i \pi m}{2} + (p - i a (m-2 s)) z} \, {}_2F_1\left(\frac{p - i a (m-2 s) + c \nu}{2 c}, \nu; \frac{p - i a (m-2 s) + c \nu}{2 c} + 1; e^{2 c z}\right)}{p - i a (m - 2 s) + c \nu} + \right.$$

$$\left. \frac{e^{(a i (m-2 s) + p) z - \frac{i m \pi}{2}} \, {}_2F_1\left(\frac{p + a i (m-2 s) + c \nu}{2 c}, \nu; \frac{p + a i (m-2 s) + c \nu}{2 c} + 1; e^{2 c z}\right)}{p + a i (m - 2 s) + c \nu} \right) +$$

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

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

$$2^{-m-u} \left(1 - e^{2 c z}\right)^\nu \operatorname{csch}^\nu(c z) \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^s \binom{m}{s} \binom{u}{k} \left(\left(e^{(p + a i (m-2 s) - b (u-2 k)) z - \frac{i m \pi}{2}} \, {}_2F_1\left(\frac{-b (u - 2 k) + p + a i (m - 2 s) + c \nu}{2 c}, \right. \right. \right.$$

$$\left. \left. \nu; \frac{-b (u - 2 k) + p + a i (m - 2 s) + c \nu}{2 c} + 1; e^{2 c z}\right)\right) \Big/ (p + a i (m - 2 s) - b (u - 2 k) + c \nu) +$$

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

$$\left. \left. e^{2 c z}\right)\right) \Big/ (p + a i (m - 2 s) + b (u - 2 k) + c \nu) + \left(e^{\frac{i \pi m}{2} + (p - i a (m-2 s) + b (u-2 k)) z} \right.$$

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

$$(p - i a (m - 2 s) + b (u - 2 k) + c \nu) + \left(e^{\frac{i \pi m}{2} + (p - i a (m-2 s) - b (u-2 k)) z} \, {}_2F_1\left(\frac{p - i a (m - 2 s) - b (u - 2 k) + c \nu}{2 c}, \right. \right.$$

$$\left. \left. \left. \nu; \frac{p - i a (m - 2 s) - b (u - 2 k) + c \nu}{2 c} + 1; e^{2 c z}\right)\right) \Big/ (p - i a (m - 2 s) - b (u - 2 k) + c \nu) \right) +$$

$$\frac{1}{p + c \nu} \left(2^{-m-u} e^{p z} \left(1 - e^{2 c z}\right)^\nu \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} \operatorname{csch}^\nu(c z) \, {}_2F_1\left(\frac{p + c \nu}{2 c}, \nu; \frac{p + c \nu}{2 c} + 1; e^{2 c z}\right) (1 - m \bmod 2) \right.$$

$$\left. (1 - u \bmod 2) \right) /; m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

01.23.21.0551.01

$$\int e^{pz} \sin^m(az) \cosh^\mu(cz) \operatorname{csch}^\nu(cz)\, dz = \frac{1}{p+c(\mu-\nu)} 2^{-m} e^{pz} \left(1-e^{-2cz}\right)^\nu \binom{m}{\frac{m}{2}} \cosh^\mu(cz) \operatorname{csch}^\nu(cz) (1 - m \bmod 2) \left(1+e^{-2cz}\right)^{-\mu} F_1\left(-\frac{p+c\mu-c\nu}{2c}; -\mu, \nu; \frac{c(-\mu+\nu+2)-p}{2c}; -e^{-2cz}, e^{-2cz}\right) + 2^{-m} \left(1-e^{-2cz}\right)^\nu \cosh^\mu(cz) \operatorname{csch}^\nu(cz) \left(1+e^{-2cz}\right)^{-\mu} \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left(\left(e^{\frac{i\pi m}{2}+(ai(2k-m)+p)z} F_1\left(-\frac{ai(2k-m)+p+c\mu-c\nu}{2c}; -\mu, \nu; \frac{-ia(2k-m)-p+c(-\mu+\nu+2)}{2c}; -e^{-2cz}, e^{-2cz}\right)\right) \Big/ (ai(2k-m)+p+c(\mu-\nu)) + \left(e^{(ai(m-2k)+p)z-\frac{im\pi}{2}} F_1\left(-\frac{ai(m-2k)+p+c\mu-c\nu}{2c}; -\mu, \nu; \frac{-ia(m-2k)-p+c(-\mu+\nu+2)}{2c}; -e^{-2cz}, e^{-2cz}\right)\right) \Big/ (ai(m-2k)+p+c(\mu-\nu))\right) /; m \in \mathbb{N}^+$$

Involving cos, cosh and exp

Involving $e^{pz} \cos(az) \cosh(bz) \operatorname{csch}^\nu(cz)$

01.23.21.0552.01

$$\int e^{pz} \cos(az) \cosh(bz) \operatorname{csch}^\nu(cz)\, dz = \frac{1}{4} \left(1-e^{2cz}\right)^\nu \operatorname{csch}^\nu(cz) \left(\frac{e^{(-b+ia+p)z}\, {}_2F_1\left(\frac{-b+ia+p+c\nu}{2c}, \nu; \frac{-b+ia+p+c\nu}{2c}+1; e^{2cz}\right)}{-b+ia+p+c\nu} + \frac{e^{(-b-ia+p)z}\, {}_2F_1\left(\frac{-b-ia+p+c\nu}{2c}, \nu; \frac{-b-ia+p+c\nu}{2c}+1; e^{2cz}\right)}{-b-ia+p+c\nu} + \frac{e^{(b+ia+p)z}\, {}_2F_1\left(\frac{b+ia+p+c\nu}{2c}, \nu; \frac{b+ia+p+c\nu}{2c}+1; e^{2cz}\right)}{b+ia+p+c\nu} + \frac{e^{(b-ia+p)z}\, {}_2F_1\left(\frac{b-ia+p+c\nu}{2c}, \nu; \frac{b-ia+p+c\nu}{2c}+1; e^{2cz}\right)}{b-ia+p+c\nu}\right)$$

Involving powers of cos, powers of cosh and exp

Involving $e^{pz} \cos^m(az) \cosh^u(bz) \operatorname{csch}^\nu(cz)$

01.23.21.0553.01

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

01.23.21.0554.01

$$\int e^{p z} \cos^m(a z) \cosh^\mu(c z) \operatorname{csch}^\nu(c z)\, dz = \frac{1}{p + c(\mu - \nu)} 2^{-m} e^{p z} \left(1 - e^{-2 c z}\right)^\nu \cosh^\mu(c z) \operatorname{csch}^\nu(c z) (1 - m \bmod 2) \left(1 + e^{-2 c z}\right)^{-\mu} \binom{m}{\frac{m}{2}} F_1\left(-\frac{p + c\mu - c\nu}{2c}; -\mu, \nu; \frac{c(-\mu + \nu + 2) - p}{2c}; -e^{-2 c z}, e^{-2 c z}\right) + 2^{-m} \left(1 - e^{-2 c z}\right)^\nu \cosh^\mu(c z) \operatorname{csch}^\nu(c z) \left(1 + e^{-2 c z}\right)^{-\mu} \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \left(\frac{e^{(-i a m + p + 2 i a s) z}}{-i a m + p + 2 i a s + c\mu - c\nu} F_1\left(\frac{i a m - p - 2 i a s - c\mu + c\nu}{2c}; -\mu, \nu; \frac{i a m - p - 2 i a s + c(-\mu + \nu + 2)}{2c}; -e^{-2 c z}, e^{-2 c z}\right) + \frac{e^{(p + a i (m - 2 s)) z}}{p + a i (m - 2 s) + c\mu - c\nu} F_1\left(-\frac{i a m + p - 2 i a s + c\mu - c\nu}{2c}; -\mu, \nu; -\frac{i a m + p - 2 i a s + c(\mu - \nu - 2)}{2c}; -e^{-2 c z}, e^{-2 c z}\right)\right)$$

Involving sin, tanh and exp

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

01.23.21.0555.01

$$\int e^{p z} \sin(a z) \tanh(c z) \operatorname{csch}^\nu(c z)\, dz = \frac{1}{2} i \left(1 - e^{-2 c z}\right)^\nu \operatorname{csch}^\nu(c z) \left(\frac{e^{(-i a + p) z} F_1\left(\frac{i a - p + c\nu}{2c}; 1, \nu - 1; \frac{1}{2}\left(\frac{i a - p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)}{-i a + p - c\nu} + \frac{e^{(i a + p) z} F_1\left(-\frac{i a + p - c\nu}{2c}; 1, \nu - 1; \frac{1}{2}\left(-\frac{i a + p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)}{-i a - p + c\nu} \right)$$

Involving powers of sin, powers of tanh and exp

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

01.23.21.0556.01

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

Involving cos, tanh and exp

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

01.23.21.0557.01

$$\int e^{p z} \cos(a z) \tanh(c z) \operatorname{csch}^\nu(c z)\, dz = \frac{1}{2} \left(1 - e^{-2 c z}\right)^\nu \operatorname{csch}^\nu(c z) \left(\frac{e^{(-i a + p) z} F_1\left(-\frac{-i a + p - c\nu}{2 c}; 1, \nu - 1; \frac{1}{2}\left(-\frac{-i a + p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)}{-i a + p - c\nu} + \frac{e^{(i a + p) z} F_1\left(-\frac{i a + p - c\nu}{2 c}; 1, \nu - 1; \frac{1}{2}\left(-\frac{i a + p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)}{i a + p - c\nu}\right)$$

Involving powers of cos, powers of tanh and exp

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

01.23.21.0558.01

$$\int e^{p z} \cos^m(a z) \tanh^\mu(c z) \operatorname{csch}^\nu(c z) \, dz = \frac{1}{p - c \nu} 2^{-m} e^{p z} \left(1 - e^{-2 c z}\right)^{\nu-\mu} \left(1 + e^{-2 c z}\right)^\mu$$

$$\operatorname{csch}^\nu(c z) (1 - m \bmod 2) \tanh^\mu(c z) F_1\left(-\frac{p - c \nu}{2 c}; \mu, \nu - \mu; \frac{1}{2}\left(-\frac{p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} +$$

$$2^{-m} \left(1 - e^{-2 c z}\right)^{\nu-\mu} \left(1 + e^{-2 c z}\right)^\mu \operatorname{csch}^\nu(c z) \tanh^\mu(c z) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left(\frac{1}{a i (2 k - m) + p - c \nu}\right.$$

$$\left(e^{(a i (2 k - m) + p) z} F_1\left(-\frac{a i (2 k - m) + p - c \nu}{2 c}; \mu, \nu - \mu; \frac{1}{2}\left(-\frac{a i (2 k - m) + p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)\right) +$$

$$\frac{1}{a i (m - 2 k) + p - c \nu} \left(e^{(a i (m - 2 k) + p) z} F_1\left(-\frac{a i (m - 2 k) + p - c \nu}{2 c}; \mu, \nu - \mu;\right.\right.$$

$$\left.\left.\left.\frac{1}{2}\left(-\frac{a i (m - 2 k) + p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)\right)\right) /; m \in \mathbb{N}^+$$

Involving sin, coth and exp

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

01.23.21.0559.01

$$\int e^{p z} \sin(a z) \coth(c z) \operatorname{csch}^\nu(c z) \, dz =$$

$$\frac{1}{2} \left(1 - e^{-2 c z}\right)^\nu \operatorname{csch}^\nu(c z) \left(\frac{e^{\frac{i \pi}{2} + (-i a + p) z} F_1\left(-\frac{-i a + p - c \nu}{2 c}; -1, \nu + 1; \frac{1}{2}\left(-\frac{-i a + p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)}{-i a + p - c \nu} +\right.$$

$$\left.\frac{e^{-\frac{1}{2}(i \pi) + (i a + p) z} F_1\left(-\frac{i a + p - c \nu}{2 c}; -1, \nu + 1; \frac{1}{2}\left(-\frac{i a + p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)}{i a + p - c \nu}\right)$$

Involving powers of sin, powers of coth and exp

Involving $e^{p z} \sin^m(a z) \coth^\mu(c z) \operatorname{csch}^\nu(c z)$

01.23.21.0560.01

$$\int e^{p z} \sin^m(a z) \coth^\mu(c z) \operatorname{csch}^\nu(c z)\, dz = \frac{1}{p - c\nu} 2^{-m} e^{p z} \left(1 - e^{-2 c z}\right)^{\mu+\nu} F_1\left(-\frac{p - c\nu}{2c}; -\mu, \mu+\nu; \frac{1}{2}\left(-\frac{p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} \coth^\mu(c z) \operatorname{csch}^\nu(c z) (1 - m \bmod 2) \left(1 + e^{-2 c z}\right)^{-\mu} + 2^{-m} \left(1 - e^{-2 c z}\right)^{\mu+\nu} \coth^\mu(c z) \operatorname{csch}^\nu(c z) \left(1 + e^{-2 c z}\right)^{-\mu} \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left(\frac{1}{a i (2k - m) + p - c\nu} \left(e^{\frac{i \pi m}{2} + (a i (2k-m) + p) z} F_1\left(-\frac{a i (2k - m) + p - c\nu}{2c}; -\mu, \mu+\nu; \frac{1}{2}\left(-\frac{a i (2k - m) + p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)\right) + \frac{1}{a i (m - 2k) + p - c\nu} \left(e^{(a i (m-2k) + p) z - \frac{i m \pi}{2}} F_1\left(-\frac{a i (m - 2k) + p - c\nu}{2c}; -\mu, \mu+\nu; \frac{1}{2}\left(-\frac{a i (m - 2k) + p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)\right)\right) /; m \in \mathbb{N}^+$$

01.23.21.0561.01

$$\int e^{p z} \sin^m(a z) \coth^u(c z) \operatorname{csch}^\nu(c z)\, dz = 2^{-m-u} \left(1 - e^{2 c z}\right)^{u+\nu} \binom{m}{\frac{m}{2}} (1 - m \bmod 2) \left(\frac{e^{p z} \binom{u}{\frac{u}{2}} {}_2F_1\left(\frac{p + c(u+\nu)}{2c}, u+\nu; \frac{p + c(u+\nu)}{2c} + 1; e^{2 c z}\right) (1 - u \bmod 2)}{p + c(u+\nu)} + \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(\frac{e^{(p - c(u - 2s)) z} {}_2F_1\left(\frac{p + c(2s+\nu)}{2c}, u+\nu; \frac{p + c(2s+\nu)}{2c} + 1; e^{2 c z}\right)}{p + c(2s + \nu)} + \frac{e^{(p + c(u - 2s)) z} {}_2F_1\left(\frac{p + c(-2s + 2u + \nu)}{2c}, u+\nu; \frac{p + c(-2s + 2u + \nu)}{2c} + 1; e^{2 c z}\right)}{p + c(-2s + 2u + \nu)}\right)\right) \operatorname{csch}^{u+\nu}(c z) + 2^{-m-u} \left(1 - e^{2 c z}\right)^{u+\nu} \left(\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \left(e^{\frac{i m \pi}{2}} \left(\left(e^{(p - i a (m - 2k)) z} \binom{u}{\frac{u}{2}} {}_2F_1\left(\frac{(p - i a (m - 2k)) + c(u+\nu)}{2c}, u+\nu; \frac{(p - i a (m - 2k)) + c(u+\nu)}{2c} + 1; e^{2 c z}\right) (1 - u \bmod 2)\right) \Big/ (-i a (m - 2k) + p + c(u+\nu)) + \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(\left(e^{(-i a (m-2k) + p - c(u - 2s)) z} {}_2F_1\left(\frac{(p - i a (m - 2k)) + c(2s+\nu)}{2c}, u+\nu; \frac{(p - i a (m - 2k)) + c(2s+\nu)}{2c} + 1; e^{2 c z}\right)\right) \Big/ (-i a (m - 2k) + p + c(2s + \nu)) + \left(e^{(-i a (m-2k) + p + c(u - 2s)) z} {}_2F_1\left(\frac{(p - i a (m - 2k)) + c(-2s + 2u + \nu)}{2c}, u+\nu; \frac{(p - i a (m - 2k)) + c(-2s + 2u + \nu)}{2c} + 1;\right.\right.\right.\right.\right.$$

$$e^{2cz}\Big)\Big) \Big/ (-i\,a\,(m-2k)+p+c\,(-2s+2u+\nu))\Big)\Big) +$$

$$e^{-\frac{1}{2} i m \pi} \Bigg(\Bigg(e^{(a\,i\,(m-2k)+p)\,z} \binom{u}{\frac{u}{2}} {}_2F_1\Bigg(\frac{(a\,i\,(m-2k)+p)+c\,(u+\nu)}{2c}, u+\nu; \frac{(a\,i\,(m-2k)+p)+c\,(u+\nu)}{2c}+1;$$

$$e^{2cz}\Bigg)(1-u \bmod 2)\Bigg) \Big/ (a\,i\,(m-2k)+p+c\,(u+\nu)) +$$

$$\sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \Bigg(\Bigg(e^{(a\,i\,(m-2k)+p-c\,(u-2s))\,z} {}_2F_1\Bigg(\frac{(a\,i\,(m-2k)+p)+c\,(2s+\nu)}{2c}, u+\nu;$$

$$\frac{(a\,i\,(m-2k)+p)+c\,(2s+\nu)}{2c}+1; e^{2cz}\Bigg)\Bigg) \Big/ (a\,i\,(m-2k)+p+c\,(2s+\nu)) +$$

$$\Bigg(e^{(a\,i\,(m-2k)+p+c\,(u-2s))\,z} {}_2F_1\Bigg(\frac{(a\,i\,(m-2k)+p)+c\,(-2s+2u+\nu)}{2c}, u+\nu;$$

$$\frac{(a\,i\,(m-2k)+p)+c\,(-2s+2u+\nu)}{2c}+1; e^{2cz}\Bigg)\Bigg) \Big/$$

$$(a\,i\,(m-2k)+p+c\,(-2s+2u+\nu))\Bigg)\Bigg)\Bigg)\Bigg) \operatorname{csch}^{u+\nu}(c\,z) \;/;\; n \in \mathbb{N} \bigwedge m \in \mathbb{N}^+ \bigwedge u \in \mathbb{N}^+$$

Involving cos, coth and exp

Involving $e^{pz} \cos(a\,z) \coth(c\,z) \operatorname{csch}^{\nu}(c\,z)$

01.23.21.0562.01

$$\int e^{pz} \cos(a\,z) \coth(c\,z) \operatorname{csch}^{\nu}(c\,z)\, dz =$$

$$\frac{1}{2}\left(1-e^{-2cz}\right)^{\nu} \operatorname{csch}^{\nu}(c\,z) \left(\frac{e^{(-i\,a+p)\,z} F_1\left(-\frac{-i\,a+p-c\,\nu}{2c}; -1, \nu+1; \frac{1}{2}\left(-\frac{-i\,a+p}{c}+\nu+2\right); -e^{-2cz}, e^{-2cz}\right)}{-i\,a+p-c\,\nu} + \right.$$

$$\left. \frac{e^{(i\,a+p)\,z} F_1\left(-\frac{i\,a+p-c\,\nu}{2c}; -1, \nu+1; \frac{1}{2}\left(-\frac{i\,a+p}{c}+\nu+2\right); -e^{-2cz}, e^{-2cz}\right)}{i\,a+p-c\,\nu} \right)$$

Involving powers of cos, powers of coth and exp

Involving $e^{pz} \cos^m(a\,z) \coth^{\mu}(c\,z) \operatorname{csch}^{\nu}(c\,z)$

01.23.21.0563.01

$$\int e^{p z} \cos^m(a z) \coth^\mu(c z) \operatorname{csch}^\nu(c z)\, dz = \frac{1}{p - c \nu} 2^{-m} e^{p z} \left(1 - e^{-2 c z}\right)^{\mu+\nu} F_1\left(-\frac{p - c \nu}{2 c}; -\mu, \mu + \nu; \frac{1}{2}\left(-\frac{p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right) \binom{m}{\frac{m}{2}} \coth^\mu(c z) \operatorname{csch}^\nu(c z) (1 - m \bmod 2) \left(1 + e^{-2 c z}\right)^{-\mu} + 2^{-m} \left(1 - e^{-2 c z}\right)^{\mu+\nu} \coth^\mu(c z) \operatorname{csch}^\nu(c z) \left(1 + e^{-2 c z}\right)^{-\mu} \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left(\frac{1}{a i (2 k - m) + p - c \nu} \left(e^{(a i (2 k - m) + p) z} F_1\left(-\frac{a i (2 k - m) + p - c \nu}{2 c}; -\mu, \mu + \nu; \frac{1}{2}\left(-\frac{a i (2 k - m) + p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)\right) + \frac{1}{a i (m - 2 k) + p - c \nu} \left(e^{(a i (m - 2 k) + p) z} F_1\left(-\frac{a i (m - 2 k) + p - c \nu}{2 c}; -\mu, \mu + \nu; \frac{1}{2}\left(-\frac{a i (m - 2 k) + p}{c} + \nu + 2\right); -e^{-2 c z}, e^{-2 c z}\right)\right)\right) /; m \in \mathbb{N}^+$$

01.23.21.0564.01

$$\int e^{pz}\cos^m(az)\coth^u(cz)\operatorname{csch}^\nu(cz)\,dz = 2^{-m-u}\left(1-e^{2cz}\right)^{u+\nu}\binom{m}{\frac{m}{2}}(1-m\bmod 2)\left(\frac{e^{pz}\binom{u}{\frac{u}{2}}\,{}_2F_1\!\left(\frac{p+c(u+\nu)}{2c},u+\nu;\frac{p+c(u+\nu)}{2c}+1;e^{2cz}\right)(1-u\bmod 2)}{p+c(u+\nu)}+\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(\frac{e^{(p-c(u-2s))z}\,{}_2F_1\!\left(\frac{p+c(2s+\nu)}{2c},u+\nu;\frac{p+c(2s+\nu)}{2c}+1;e^{2cz}\right)}{p+c(2s+\nu)}+\frac{e^{(p+c(u-2s))z}\,{}_2F_1\!\left(\frac{p+c(-2s+2u+\nu)}{2c},u+\nu;\frac{p+c(-2s+2u+\nu)}{2c}+1;e^{2cz}\right)}{p+c(-2s+2u+\nu)}\right)\right)\operatorname{csch}^{u+\nu}(cz)+2^{-m-u}\left(1-e^{2cz}\right)^{u+\nu}\left(\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\left(\left(e^{(p-ia(m-2k))z}\binom{u}{\frac{u}{2}}\,{}_2F_1\!\left(\frac{(p-ia(m-2k))+c(u+\nu)}{2c},u+\nu;\frac{(p-ia(m-2k))+c(u+\nu)}{2c}+1;e^{2cz}\right)(1-u\bmod 2)\right)\Big/(-ia(m-2k)+p+c(u+\nu))+\left(e^{(ai(m-2k)+p)z}\binom{u}{\frac{u}{2}}\,{}_2F_1\!\left(\frac{(ai(m-2k)+p)+c(u+\nu)}{2c},u+\nu;\frac{(ai(m-2k)+p)+c(u+\nu)}{2c}+1;e^{2cz}\right)(1-u\bmod 2)\right)\Big/(ai(m-2k)+p+c(u+\nu))+\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(\left(e^{(-ia(m-2k)+p-c(u-2s))z}\,{}_2F_1\!\left(\frac{(p-ia(m-2k))+c(2s+\nu)}{2c},u+\nu;\frac{(p-ia(m-2k))+c(2s+\nu)}{2c}+1;e^{2cz}\right)\right)\Big/(-ia(m-2k)+p+c(2s+\nu))+\left(e^{(-ia(m-2k)+p+c(u-2s))z}\,{}_2F_1\!\left(\frac{(p-ia(m-2k))+c(-2s+2u+\nu)}{2c},u+\nu;\frac{(p-ia(m-2k))+c(-2s+2u+\nu)}{2c}+1;e^{2cz}\right)\right)\Big/(-ia(m-2k)+p+c(-2s+2u+\nu))\right)+\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(\left(e^{(ai(m-2k)+p-c(u-2s))z}\,{}_2F_1\!\left(\frac{(ai(m-2k)+p)+c(2s+\nu)}{2c},u+\nu;\frac{(ai(m-2k)+p)+c(2s+\nu)}{2c}+1;e^{2cz}\right)\right)\Big/(ai(m-2k)+p+c(2s+\nu))+\left(e^{(ai(m-2k)+p+c(u-2s))z}\,{}_2F_1\!\left(\frac{(ai(m-2k)+p)+c(-2s+2u+\nu)}{2c},u+\nu;\frac{(ai(m-2k)+p)+c(-2s+2u+\nu)}{2c}+1;e^{2cz}\right)\right)\Big/(ai(m-2k)+p+c(-2s+2u+\nu))\right)\right)\right)\operatorname{csch}^{u+\nu}(cz)\;/;\;n\in\mathbb{N}\land m\in\mathbb{N}^+\land u\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 $z^n \sin(a z) \sinh(b z) \operatorname{csch}^\nu(c z)$

01.23.21.0565.01

$$\int z^n \sin(a z) \sinh(b z) \operatorname{csch}^\nu(c z)\, dz = \frac{i}{4} \left(1 - e^{2 c z}\right)^\nu \operatorname{csch}^\nu(c z)\, n! \left(-e^{(-i a - b) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a - b + c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(\frac{-i a - b + c\nu}{2c}, \ldots, \frac{-i a - b + c\nu}{2c}, \nu; \frac{-i a - b + c\nu}{2c} + 1, \ldots, \frac{-i a - b + c\nu}{2c} + 1; e^{2 c z}\right) - e^{(i a + b) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b + i a + c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(\frac{b + i a + c\nu}{2c}, \ldots, \frac{b + i a + c\nu}{2c}, \nu; \frac{b + i a + c\nu}{2c} + 1, \ldots, \frac{c\nu + i a + b}{2c} + 1; e^{2 c z}\right) + e^{(i a - b) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i a - b + c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(\frac{i a - b + c\nu}{2c}, \ldots, \frac{i a - b + c\nu}{2c}, \nu; \frac{i a - b + c\nu}{2c} + 1, \ldots, \frac{i a - b + c\nu}{2c} + 1; e^{2 c z}\right) + e^{(-i a + b) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a + b + c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(\frac{-i a + b + c\nu}{2c}, \ldots, \frac{-i a + b + c\nu}{2c}, \nu; \frac{-i a + b + c\nu}{2c} + 1, \ldots, \frac{-i a + b + c\nu}{2c} + 1; e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

Involving powers of sin, powers of sinh and power

Involving $z^n \sin^m(a z) \sinh^u(b z) \operatorname{csch}^\nu(c z)$

01.23.21.0566.01

$$\int z^n \sin^m(a z) \sinh^u(b z) \operatorname{csch}^\nu(c z)\, dz = i^u\, 2^{-m-u} \left(1 - e^{2 c z}\right)^\nu \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} \operatorname{csch}^\nu(c z)\, n!\, (1 - m \bmod 2)(1 - u \bmod 2) \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c\nu)^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(\frac{\nu}{2}, \ldots, \frac{\nu}{2}, \nu; \frac{\nu}{2} + 1, \ldots, \frac{\nu}{2} + 1; e^{2 c z}\right) + i^{m+u}\, 2^{-m-u} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) \left(1 - e^{2 c z}\right)^\nu \operatorname{csch}^\nu(c z)\, n! \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^s \binom{m}{s} \left(e^{-i a (m - 2 s) z} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (c\nu - i a (m - 2 s))^{-j-1}\right)}{(n-j)!}\, {}_{j+2}F_{j+1}\!\left(\frac{c\nu - i a (m - 2 s)}{2c}, \ldots, \frac{c\nu - i a (m - 2 s)}{2c}, \right.\right.$$

$$\nu;\ \frac{c\,\nu-i\,a\,(m-2\,s)}{2\,c}+1,\,\ldots,\,\frac{c\,\nu-i\,a\,(m-2\,s)}{2\,c}+1;\,e^{2\,c\,z}\Bigg)+(-1)^m\,e^{i\,a\,(m-2\,s)\,z}$$

$$\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(a\,i\,(m-2\,s)+c\,\nu)^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\Bigg(\frac{i\,a\,(m-2\,s)+c\,\nu}{2\,c},\,\ldots,\,\frac{i\,a\,(m-2\,s)+c\,\nu}{2\,c},\,\nu;$$

$$\frac{i\,a\,(m-2\,s)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{i\,a\,(m-2\,s)+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\Bigg)\Bigg)+$$

$$2^{-m-u}\binom{m}{\frac{m}{2}}(1-m\bmod 2)\left(1-e^{2\,c\,z}\right)^{\nu}\operatorname{csch}^{\nu}(c\,z)\,n!\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\Bigg((-1)^u\,e^{-b\,(u-2\,k)\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(c\,\nu-b\,(u-2\,k))^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{c\,\nu-b\,(u-2\,k)}{2\,c},\,\ldots,\,\frac{c\,\nu-b\,(u-2\,k)}{2\,c},\,\nu;\,\frac{c\,\nu-b\,(u-2\,k)}{2\,c}+1,\,\ldots,\,\frac{c\,\nu-b\,(u-2\,k)}{2\,c}+1;\,e^{2\,c\,z}\Bigg)+$$

$$e^{b\,(u-2\,k)\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(b\,(u-2\,k)+c\,\nu)^{-j-1}\right)}{(n-j)!}\,{}_{j+2}F_{j+1}\Bigg(\frac{b\,(u-2\,k)+c\,\nu}{2\,c},\,\ldots,\,\frac{b\,(u-2\,k)+c\,\nu}{2\,c},\,\nu;$$

$$\frac{b\,(u-2\,k)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{b\,(u-2\,k)+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\Bigg)\Bigg)+2^{-m-u}\,n!\operatorname{csch}^{\nu}(c\,z)\left(1-e^{2\,c\,z}\right)^{\nu}$$

$$\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^{k+s}\binom{m}{s}\binom{u}{k}\Bigg((-1)^u\,e^{\frac{i\,\pi\,m}{2}+(-i\,a\,(m-2\,s)-b\,(u-2\,k))\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(-i\,a\,(m-2\,s)-b\,(u-2\,k)+c\,\nu)^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{-i\,a\,(m-2\,s)-b\,(u-2\,k)+c\,\nu}{2\,c},\,\ldots,\,\frac{-i\,a\,(m-2\,s)-b\,(u-2\,k)+c\,\nu}{2\,c},\,\nu;$$

$$\frac{-i\,a\,(m-2\,s)-b\,(u-2\,k)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{-i\,a\,(m-2\,s)-b\,(u-2\,k)+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\Bigg)+$$

$$(-1)^u\,e^{(i\,a\,(m-2\,s)-b\,(u-2\,k))\,z-\frac{i\,m\,\pi}{2}}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(a\,i\,(m-2\,s)-b\,(u-2\,k)+c\,\nu)^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{i\,a\,(m-2\,s)-b\,(u-2\,k)+c\,\nu}{2\,c},\,\ldots,\,\frac{i\,a\,(m-2\,s)-b\,(u-2\,k)+c\,\nu}{2\,c},\,\nu;$$

$$\frac{i\,a\,(m-2\,s)-b\,(u-2\,k)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{i\,a\,(m-2\,s)-b\,(u-2\,k)+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\Bigg)+$$

$$e^{\frac{i\,\pi\,m}{2}+(b\,(u-2\,k)-i\,a\,(m-2\,s))\,z}\sum_{j=0}^{n}\frac{\left((-1)^j\,z^{n-j}\,(-i\,a\,(m-2\,s)+b\,(u-2\,k)+c\,\nu)^{-j-1}\right)}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{-i\,a\,(m-2\,s)+b\,(u-2\,k)+c\,\nu}{2\,c},\,\ldots,\,\frac{-i\,a\,(m-2\,s)+b\,(u-2\,k)+c\,\nu}{2\,c},\,\nu;$$

$$\frac{-i\,a\,(m-2\,s)+b\,(u-2\,k)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{-i\,a\,(m-2\,s)+b\,(u-2\,k)+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\Bigg)+$$

$$e^{(a\,i\,(m-2s)+b\,(u-2k))\,z-\frac{i\,m\,\pi}{2}} \sum_{j=0}^{n} \frac{\left((-1)^j z^{n-j} (a\,i\,(m-2s)+b\,(u-2k)+c\,\nu)^{-j-1}\right)}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{i\,a\,(m-2s)+b\,(u-2k)+c\,\nu}{2c}, \ldots, \frac{i\,a\,(m-2s)+b\,(u-2k)+c\,\nu}{2c}, \nu; \frac{i\,a\,(m-2s)+b\,(u-2k)+c\,\nu}{2c}+1, \ldots, \frac{i\,a\,(m-2s)+b\,(u-2k)+c\,\nu}{2c}+1; e^{2cz}\right)\Bigg) /; n \in \mathbb{N} \bigwedge m \in \mathbb{N}^+ \bigwedge u \in \mathbb{N}^+$$

Involving cos, sinh and power

Involving $z^n \cos(a\,z) \sinh(b\,z) \operatorname{csch}^\nu(c\,z)$

01.23.21.0567.01

$$\int z^n \cos(a\,z) \sinh(b\,z) \operatorname{csch}^\nu(c\,z)\, dz = \frac{1}{4}\left(1-e^{2cz}\right)^\nu \operatorname{csch}^\nu(c\,z)\, n! \Bigg(-e^{(-i\,a-b)\,z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i\,a-b+c\,\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{-i\,a-b+c\,\nu}{2c}, \ldots, \frac{-i\,a-b+c\,\nu}{2c}, \nu; \frac{-i\,a-b+c\,\nu}{2c}+1, \ldots, \frac{-i\,a-b+c\,\nu}{2c}+1; e^{2cz}\right) + e^{(i\,a+b)\,z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b+i\,a+c\,\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{b+i\,a+c\,\nu}{2c}, \ldots, \frac{b+i\,a+c\,\nu}{2c}, \nu; \frac{b+i\,a+c\,\nu}{2c}+1, \ldots, \frac{b+i\,a+c\,\nu}{2c}+1; e^{2cz}\right) - e^{(i\,a-b)\,z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i\,a-b+c\,\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{i\,a-b+c\,\nu}{2c}, \ldots, \frac{i\,a-b+c\,\nu}{2c}, \nu; \frac{i\,a-b+c\,\nu}{2c}+1, \ldots, \frac{i\,a-b+c\,\nu}{2c}+1; e^{2cz}\right) + e^{(-i\,a+b)\,z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i\,a+b+c\,\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{-i\,a+b+c\,\nu}{2c}, \ldots, \frac{-i\,a+b+c\,\nu}{2c}, \nu; \frac{-i\,a+b+c\,\nu}{2c}+1, \ldots, \frac{-i\,a+b+c\,\nu}{2c}+1; e^{2cz}\right)\Bigg) /; n \in \mathbb{N}$$

Involving powers of cos, powers of sinh and power

Involving $z^n \cos^m(a\,z) \sinh^u(b\,z) \operatorname{csch}^\nu(c\,z)$

01.23.21.0568.01

$$\int z^n \cos^m(a\,z) \sinh^u(b\,z) \operatorname{csch}^\nu(c\,z)\, dz = i^u\, 2^{-m-u} \left(1-e^{2cz}\right)^\nu \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} \operatorname{csch}^\nu(c\,z)\, n! \, (1-m \bmod 2)\,(1-u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c\,\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{\nu}{2}, \ldots, \frac{\nu}{2}, \nu; \frac{\nu}{2}+1, \ldots, \frac{\nu}{2}+1; e^{2cz}\right) + i^u\, 2^{-m-u} \binom{u}{\frac{u}{2}} (1-u \bmod 2) \left(1-e^{2cz}\right)^\nu \operatorname{csch}^\nu(c\,z)\, n! \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \Bigg(e^{(a\,i\,(m-2s))\,z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (a\,i\,(m-2s)+c\,\nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}$$

$$\left(\frac{a\,i\,(m-2s)+c\,\nu}{2c},\,\ldots,\,\frac{a\,i\,(m-2s)+c\,\nu}{2c},\,\nu;\,\frac{a\,i\,(m-2s)+c\,\nu}{2c}+1,\,\ldots,\,\frac{a\,i\,(m-2s)+c\,\nu}{2c}+1;\,e^{2cz}\right)+$$

$$e^{(-i\,a\,(m-2s))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(-i\,a\,(m-2s)+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{-i\,a\,(m-2s)+c\,\nu}{2c},\,\ldots,\right.$$

$$\left.\left.\frac{-i\,a\,(m-2s)+c\,\nu}{2c},\,\nu;\,\frac{-i\,a\,(m-2s)+c\,\nu}{2c}+1,\,\ldots,\,\frac{-i\,a\,(m-2s)+c\,\nu}{2c}+1;\,e^{2cz}\right)\right)+$$

$$2^{-m-u}\binom{m}{\frac{m}{2}}(1-m\bmod 2)\left(1-e^{2cz}\right)^{\nu}\operatorname{csch}^{\nu}(c\,z)\,n!\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}\left(e^{(b\,(u-2k))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(b\,(u-2k)+c\,\nu)^{-j-1}}{(n-j)!}\right.$$

$${}_{j+2}F_{j+1}\!\left(\frac{b\,(u-2k)+c\,\nu}{2c},\,\ldots,\,\frac{b\,(u-2k)+c\,\nu}{2c},\,\nu;\,\frac{b\,(u-2k)+c\,\nu}{2c}+1,\,\ldots,\,\frac{b\,(u-2k)+c\,\nu}{2c}+1;\,e^{2cz}\right)+$$

$$(-1)^u\,e^{(-b\,(u-2k))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(-b\,(u-2k)+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\!\left(\frac{-b\,(u-2k)+c\,\nu}{2c},\,\ldots,\,\frac{-b\,(u-2k)+c\,\nu}{2c},\right.$$

$$\left.\left.\nu;\,\frac{-b\,(u-2k)+c\,\nu}{2c}+1,\,\ldots,\,\frac{-b\,(u-2k)+c\,\nu}{2c}+1;\,e^{2cz}\right)\right)+\,2^{-m-u}\,n!\operatorname{csch}^{\nu}(c\,z)\left(1-e^{2cz}\right)^{\nu}$$

$$\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{s}\binom{u}{k}\left(e^{(-i\,a\,(m-2s)+b\,(u-2k))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(-i\,a\,(m-2s)+b\,(-2k+u)+c\,\nu)^{-j-1}}{(n-j)!}\right.$$

$${}_{j+2}F_{j+1}\!\left(\frac{-i\,a\,(m-2s)+b\,(-2k+u)+c\,\nu}{2c},\,\ldots,\,\frac{-i\,a\,(m-2s)+b\,(-2k+u)+c\,\nu}{2c},\,\nu;\right.$$

$$\left.\frac{-i\,a\,(m-2s)+b\,(-2k+u)+c\,\nu}{2c}+1,\,\ldots,\,\frac{-i\,a\,(m-2s)+b\,(-2k+u)+c\,\nu}{2c}+1;\,e^{2cz}\right)+$$

$$(-1)^u\,e^{(a\,i\,(m-2s)-b\,(u-2k))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(i\,a\,(m-2s)-b\,(-2k+u)+c\,\nu)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\!\left(\frac{i\,a\,(m-2s)-b\,(-2k+u)+c\,\nu}{2c},\,\ldots,\,\frac{i\,a\,(m-2s)-b\,(-2k+u)+c\,\nu}{2c},\,\nu;\right.$$

$$\left.\frac{i\,a\,(m-2s)-b\,(-2k+u)+c\,\nu}{2c}+1,\,\ldots,\,\frac{i\,a\,(m-2s)-b\,(-2k+u)+c\,\nu}{2c}+1;\,e^{2cz}\right)+$$

$$(-1)^u\,e^{(-i\,a\,(m-2s)-b\,(u-2k))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(-i\,a\,(m-2s)-b\,(-2k+u)+c\,\nu)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\!\left(\frac{-i\,a\,(m-2s)-b\,(-2k+u)+c\,\nu}{2c},\,\ldots,\,\frac{-i\,a\,(m-2s)-b\,(-2k+u)+c\,\nu}{2c},\,\nu;\right.$$

$$\left.\frac{-i\,a\,(m-2s)-b\,(-2k+u)+c\,\nu}{2c}+1,\,\ldots,\,\frac{-i\,a\,(m-2s)-b\,(-2k+u)+c\,\nu}{2c}+1;\,e^{2cz}\right)+$$

$$e^{(a\,i\,(m-2s)+b\,(u-2k))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(i\,a\,(m-2s)+b\,(-2k+u)+c\,\nu)^{-j-1}}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\left(\frac{i\,a\,(m-2\,s)+b\,(-2\,k+u)+c\,\nu}{2\,c},\,\ldots,\,\frac{i\,a\,(m-2\,s)+b\,(-2\,k+u)+c\,\nu}{2\,c},\,\nu;\,\frac{i\,a\,(m-2\,s)+b\,(-2\,k+u)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{i\,a\,(m-2\,s)+b\,(-2\,k+u)+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\right)\Bigg)\Bigg) /;\, n\in\mathbb{N}\bigwedge m\in\mathbb{N}^+\bigwedge u\in\mathbb{N}^+ $$

Involving sin, cosh and power

Involving $z^n \sin(a\,z)\cosh(b\,z)\operatorname{csch}^\nu(c\,z)$

01.23.21.0569.01

$$ \int z^n \sin(a\,z)\cosh(b\,z)\operatorname{csch}^\nu(c\,z)\,dz = \frac{1}{4}\,i\left(1-e^{2\,c\,z}\right)^\nu \operatorname{csch}^\nu(c\,z)\,n!\Bigg(e^{(-b-i\,a)\,z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(-b-i\,a+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{-i\,a-b+c\,\nu}{2\,c},\,\ldots,\,\frac{-i\,a-b+c\,\nu}{2\,c},\,\nu;\,\frac{-i\,a-b+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{-i\,a-b+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\right) - e^{(i\,a-b)\,z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(-b+i\,a+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{i\,a-b+c\,\nu}{2\,c},\,\ldots,\,\frac{i\,a-b+c\,\nu}{2\,c},\,\nu;\,\frac{i\,a-b+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{i\,a-b+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\right) + e^{(b-i\,a)\,z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(b-i\,a+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{-i\,a+b+c\,\nu}{2\,c},\,\ldots,\,\frac{-i\,a+b+c\,\nu}{2\,c},\,\nu;\,\frac{-i\,a+b+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{-i\,a+b+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\right) - e^{(b+i\,a)\,z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(b+i\,a+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{i\,a+b+c\,\nu}{2\,c},\,\ldots,\,\frac{i\,a+b+c\,\nu}{2\,c},\,\nu;\,\frac{i\,a+b+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{i\,a+b+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\right)\Bigg) /;\, n\in\mathbb{N} $$

Involving powers of sin, powers of cosh and power

Involving $z^n \sin^m(a\,z)\cosh^u(b\,z)\operatorname{csch}^\nu(c\,z)$

01.23.21.0570.01

$$ \int z^n \sin^m(a\,z)\cosh^u(b\,z)\operatorname{csch}^\nu(c\,z)\,dz = 2^{-m-u}\left(1-e^{2\,c\,z}\right)^\nu \binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}\,n!\,(1-m \bmod 2)\,(1-u \bmod 2)\operatorname{csch}^\nu(c\,z)\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{\nu}{2},\,\ldots,\,\frac{\nu}{2},\,\nu;\,\frac{\nu}{2}+1,\,\ldots,\,\frac{\nu}{2}+1;\,e^{2\,c\,z}\right) + 2^{-m-u}\left(1-e^{2\,c\,z}\right)^\nu\binom{u}{\frac{u}{2}}\,n!\,(1-u \bmod 2)\operatorname{csch}^\nu(c\,z)\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\Bigg(e^{(a\,i\,(m-2\,k))\,z-\frac{i\,m\,\pi}{2}}\sum_{j=0}^{n}\frac{1}{(n-j)!}\,(-1)^j z^{n-j}\,(a\,i\,(m-2\,k)+c\,\nu)^{-j-1}\,{}_{j+2}F_{j+1} $$

$$\left(\frac{a\,i\,(m-2k)+c\,\nu}{2c},\,\ldots,\,\frac{a\,i\,(m-2k)+c\,\nu}{2c},\,\nu;\,\frac{a\,i\,(m-2k)+c\,\nu}{2c}+1,\,\ldots,\,\frac{a\,i\,(m-2k)+c\,\nu}{2c}+1;\,e^{2cz}\right)+$$

$$e^{\frac{i\pi m}{2}+(-i\,a\,(m-2k))\,z}\sum_{j=0}^{n}\frac{1}{(n-j)!}\,(-1)^j\,z^{n-j}\,(-i\,a\,(m-2k)+c\,\nu)^{-j-1}\;{}_{j+2}F_{j+1}\left(\frac{-i\,a\,(m-2k)+c\,\nu}{2c},\right.$$

$$\left.\left.\ldots,\,\frac{-i\,a\,(m-2k)+c\,\nu}{2c},\,\nu;\,\frac{-i\,a\,(m-2k)+c\,\nu}{2c}+1,\,\ldots,\,\frac{-i\,a\,(m-2k)+c\,\nu}{2c}+1;\,e^{2cz}\right)\right)-$$

$$2^{-m-u}\binom{m}{\frac{m}{2}}(m \bmod 2-1)\left(1-e^{2cz}\right)^{\nu}\,n!\,\operatorname{csch}^{\nu}(c\,z)\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(e^{(b\,(u-2s))\,z}\sum_{j=0}^{n}\frac{1}{(n-j)!}\,(-1)^j\,z^{n-j}\,(b\,(u-2s)+c\,\nu)^{-j-1}\right.$$

$${}_{j+2}F_{j+1}\left(\frac{b\,(u-2s)+c\,\nu}{2c},\,\ldots,\,\frac{b\,(u-2s)+c\,\nu}{2c},\,\nu;\,\frac{b\,(u-2s)+c\,\nu}{2c}+1,\,\ldots,\,\frac{b\,(u-2s)+c\,\nu}{2c}+1;\,e^{2cz}\right)+$$

$$e^{(-b\,(u-2s))\,z}\sum_{j=0}^{n}\frac{1}{(n-j)!}\,(-1)^j\,z^{n-j}\,(-b\,(u-2s)+c\,\nu)^{-j-1}\;{}_{j+2}F_{j+1}\left(\frac{-b\,(u-2s)+c\,\nu}{2c},\,\ldots,\,\frac{-b\,(u-2s)+c\,\nu}{2c},\right.$$

$$\left.\left.\nu;\,\frac{-b\,(u-2s)+c\,\nu}{2c}+1,\,\ldots,\,\frac{-b\,(u-2s)+c\,\nu}{2c}+1;\,e^{2cz}\right)\right)+2^{-m-u}\left(1-e^{2cz}\right)^{\nu}\,n!\,\operatorname{csch}^{\nu}(c\,z)$$

$$\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{m}{k}\binom{u}{s}\left(e^{(a\,i\,(m-2k)-b\,(u-2s))\,z-\frac{i\,m\,\pi}{2}}\sum_{j=0}^{n}\frac{1}{(n-j)!}\,(-1)^j\,z^{n-j}\,(a\,i\,(m-2k)-b\,(u-2s)+c\,\nu)^{-j-1}\right.$$

$${}_{j+2}F_{j+1}\left(\frac{a\,i\,(m-2k)-b\,(u-2s)+c\,\nu}{2c},\,\ldots,\,\frac{a\,i\,(m-2k)-b\,(u-2s)+c\,\nu}{2c},\,\nu;\right.$$

$$\left.\frac{a\,i\,(m-2k)-b\,(u-2s)+c\,\nu}{2c}+1,\,\ldots,\,\frac{a\,i\,(m-2k)-b\,(u-2s)+c\,\nu}{2c}+1;\,e^{2cz}\right)+$$

$$e^{\frac{i\pi m}{2}+(-i\,a\,(m-2k)+b\,(u-2s))\,z}\sum_{j=0}^{n}\frac{1}{(n-j)!}\,(-1)^j\,z^{n-j}\,(-i\,a\,(m-2k)+b\,(u-2s)+c\,\nu)^{-j-1}$$

$${}_{j+2}F_{j+1}\left(\frac{-a\,i\,(m-2k)+b\,(u-2s)+c\,\nu}{2c},\,\ldots,\,\frac{-a\,i\,(m-2k)+b\,(u-2s)+c\,\nu}{2c},\,\nu;\right.$$

$$\left.\frac{-a\,i\,(m-2k)+b\,(u-2s)+c\,\nu}{2c}+1,\,\ldots,\,\frac{-a\,i\,(m-2k)+b\,(u-2s)+c\,\nu}{2c}+1;\,e^{2cz}\right)+$$

$$e^{\frac{i\pi m}{2}+(-i\,a\,(m-2k)-b\,(u-2s))\,z}\sum_{j=0}^{n}\frac{1}{(n-j)!}\,(-1)^j\,z^{n-j}\,(-i\,a\,(m-2k)-b\,(u-2s)+c\,\nu)^{-j-1}$$

$${}_{j+2}F_{j+1}\left(\frac{-a\,i\,(m-2k)-b\,(u-2s)+c\,\nu}{2c},\,\ldots,\,\frac{-a\,i\,(m-2k)-b\,(u-2s)+c\,\nu}{2c},\,\nu;\right.$$

$$\left.\frac{-a\,i\,(m-2k)-b\,(u-2s)+c\,\nu}{2c}+1,\,\ldots,\,\frac{-a\,i\,(m-2k)-b\,(u-2s)+c\,\nu}{2c}+1;\,e^{2cz}\right)+$$

$$e^{(a\,i\,(m-2k)+b\,(u-2s))\,z-\frac{i\,m\,\pi}{2}}\sum_{j=0}^{n}\frac{1}{(n-j)!}\,(-1)^j\,z^{n-j}\,(a\,i\,(m-2k)+b\,(u-2s)+c\,\nu)^{-j-1}\;{}_{j+2}F_{j+1}$$

$$\left(\frac{a\,i\,(m-2k)+b\,(u-2s)+c\,\nu}{2c},\,\ldots,\,\frac{a\,i\,(m-2k)+b\,(u-2s)+c\,\nu}{2c},\,\nu;\,\frac{a\,i\,(m-2k)+b\,(u-2s)+c\,\nu}{2c}+\right.$$

Involving cos, cosh and power

Involving $z^n \cos(a z) \cosh(b z) \operatorname{csch}^{\nu}(c z)$

01.23.21.0571.01

$$\int z^n \cos(a z) \cosh(b z) \operatorname{csch}^{\nu}(c z)\, dz = \frac{1}{4}\left(1-e^{2 c z}\right)^{\nu} \operatorname{csch}^{\nu}(c z)\, n! \left(e^{(-i a-b) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a-b+c \nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c \nu-i a-b}{2 c}, \ldots, \frac{c \nu-i a-b}{2 c}, \nu; \frac{c \nu-i a-b}{2 c}+1, \ldots, \frac{c \nu-i a-b}{2 c}+1; e^{2 c z}\right) + e^{(i a+b) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b+i a+c \nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c \nu+i a+b}{2 c}, \ldots, \frac{c \nu+i a+b}{2 c}, \nu; \frac{c \nu+i a+b}{2 c}+1, \ldots, \frac{c \nu+i a+b}{2 c}+1; e^{2 c z}\right) + e^{(i a-b) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i a-b+c \nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{i a-b+c \nu}{2 c}, \ldots, \frac{i a-b+c \nu}{2 c}, \nu; \frac{i a-b+c \nu}{2 c}+1, \ldots, \frac{i a-b+c \nu}{2 c}+1; e^{2 c z}\right) + e^{(-i a+b) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a+b+c \nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{-i a+b+c \nu}{2 c}, \ldots, \frac{-i a+b+c \nu}{2 c}, \nu; \frac{-i a+b+c \nu}{2 c}+1, \ldots, \frac{-i a+b+c \nu}{2 c}+1; e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

Involving powers of cos, powers of cosh and power

Involving $z^n \cos^m(a z) \cosh^u(b z) \operatorname{csch}^{\nu}(c z)$

01.23.21.0572.01

$$\int z^n \cos^m(a z) \cosh^u(b z) \operatorname{csch}^{\nu}(c z)\, dz = 2^{-m-u} \left(1-e^{2 c z}\right)^{\nu} \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n!\, (1-m \bmod 2)(1-u \bmod 2) \operatorname{csch}^{\nu}(c z) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c \nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{\nu}{2}, \ldots, \frac{\nu}{2}, \nu; \frac{\nu}{2}+1, \ldots, \frac{\nu}{2}+1; e^{2 c z}\right) + 2^{-m-u} \left(1-e^{2 c z}\right)^{\nu} \binom{u}{\frac{u}{2}} n!\, (1-u \bmod 2) \operatorname{csch}^{\nu}(c z) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left(e^{(a i (m-2 k)) z} \sum_{j=0}^{n} \frac{1}{(n-j)!} (-1)^j z^{n-j} (a i (m-2 k)+c \nu)^{-j-1}\, {}_{j+2}F_{j+1}\left(\frac{a i (m-2 k)+c \nu}{2 c}, \ldots, \frac{a i (m-2 k)+c \nu}{2 c}, \nu; \frac{a i (m-2 k)+c \nu}{2 c}+1, \ldots, \frac{a i (m-2 k)+c \nu}{2 c}+1; e^{2 c z}\right) + e^{(-i a (m-2 k)) z} \sum_{j=0}^{n} \frac{1}{(n-j)!} (-1)^j z^{n-j} (-i a (m-2 k)+c \nu)^{-j-1}\, {}_{j+2}F_{j+1}\left(\frac{-i a (m-2 k)+c \nu}{2 c}, \ldots, \frac{-i a (m-2 k)+c \nu}{2 c}, \nu; \frac{-i a (m-2 k)+c \nu}{2 c}+1, \ldots, \frac{-i a (m-2 k)+c \nu}{2 c}+1; e^{2 c z}\right)\right) -$$

$$2^{-m-u}\binom{m}{\frac{m}{2}}(m \bmod 2-1)\left(1-e^{2cz}\right)^{\nu} n!\operatorname{csch}^{\nu}(cz)\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(e^{(b(u-2s))z}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^{j}z^{n-j}(b(u-2s)+c\nu)^{-j-1}\right.$$
$$ {}_{j+2}F_{j+1}\left(\frac{b(u-2s)+c\nu}{2c},\ldots,\frac{b(u-2s)+c\nu}{2c},\nu;\frac{b(u-2s)+c\nu}{2c}+1,\ldots,\frac{b(u-2s)+c\nu}{2c}+1;e^{2cz}\right)+$$
$$e^{(-b(u-2s))z}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^{j}z^{n-j}(-b(u-2s)+c\nu)^{-j-1}{}_{j+2}F_{j+1}\left(\frac{-b(u-2s)+c\nu}{2c},\ldots,\frac{-b(u-2s)+c\nu}{2c},\right.$$
$$\left.\left.\nu;\frac{-b(u-2s)+c\nu}{2c}+1,\ldots,\frac{-b(u-2s)+c\nu}{2c}+1;e^{2cz}\right)\right)+2^{-m-u}\left(1-e^{2cz}\right)^{\nu}n!\operatorname{csch}^{\nu}(cz)$$
$$\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{m}{k}\binom{u}{s}\left(e^{(ai(m-2k)-b(u-2s))z}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^{j}z^{n-j}(ai(m-2k)-b(u-2s)+c\nu)^{-j-1}\right.$$
$${}_{j+2}F_{j+1}\left(\frac{ai(m-2k)-b(u-2s)+c\nu}{2c},\ldots,\frac{ai(m-2k)-b(u-2s)+c\nu}{2c},\nu;\right.$$
$$\left.\frac{ai(m-2k)-b(u-2s)+c\nu}{2c}+1,\ldots,\frac{ai(m-2k)-b(u-2s)+c\nu}{2c}+1;e^{2cz}\right)+$$
$$e^{(-ia(m-2k)+b(u-2s))z}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^{j}z^{n-j}(-ia(m-2k)+b(u-2s)+c\nu)^{-j-1}$$
$${}_{j+2}F_{j+1}\left(\frac{-ai(m-2k)+b(u-2s)+c\nu}{2c},\ldots,\frac{-ai(m-2k)+b(u-2s)+c\nu}{2c},\nu;\right.$$
$$\left.\frac{-ai(m-2k)+b(u-2s)+c\nu}{2c}+1,\ldots,\frac{-ai(m-2k)+b(u-2s)+c\nu}{2c}+1;e^{2cz}\right)+$$
$$e^{(-ia(m-2k)-b(u-2s))z}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^{j}z^{n-j}(-ia(m-2k)-b(u-2s)+c\nu)^{-j-1}$$
$${}_{j+2}F_{j+1}\left(\frac{-ai(m-2k)-b(u-2s)+c\nu}{2c},\ldots,\frac{-ai(m-2k)-b(u-2s)+c\nu}{2c},\nu;\right.$$
$$\left.\frac{-ai(m-2k)-b(u-2s)+c\nu}{2c}+1,\ldots,\frac{-ai(m-2k)-b(u-2s)+c\nu}{2c}+1;e^{2cz}\right)+$$
$$e^{(ai(m-2k)+b(u-2s))z}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^{j}z^{n-j}(ai(m-2k)+b(u-2s)+c\nu)^{-j-1}{}_{j+2}F_{j+1}$$
$$\left(\frac{ai(m-2k)+b(u-2s)+c\nu}{2c},\ldots,\frac{ai(m-2k)+b(u-2s)+c\nu}{2c},\nu;\frac{ai(m-2k)+b(u-2s)+c\nu}{2c}+\right.$$
$$\left.\left.1,\ldots,\frac{ai(m-2k)+b(u-2s)+c\nu}{2c}+1;e^{2cz}\right)\right)/;n\in\mathbb{N}\wedge m\in\mathbb{N}^{+}\wedge u\in\mathbb{N}^{+}$$

Involving powers of sin, powers of tanh and power

Involving $z^n \sin^m(a z) \tanh^u(c z) \operatorname{csch}^{\nu}(c z)$

01.23.21.0573.01

$$\int z^n \sin^m(a z) \tanh^u(c z) \operatorname{csch}^v(c z)\, dz = i^{u-v} 2^{v-m} e^{c u z} \binom{m}{\frac{m}{2}} \binom{u-v}{\frac{u-v}{2}} n!\, (1 - m \bmod 2) (1 - (u-v) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (c u)^{-j-1} z^{n-j}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{u}{2}, \ldots, \frac{u}{2}, u; \frac{u}{2}+1, \ldots, \frac{u}{2}+1; -e^{2 c z}\right) +$$

$$i^{u-v} 2^{v-m} \binom{u-v}{\frac{u-v}{2}} n!\, (1 - (u-v) \bmod 2) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \Bigg(e^{\frac{i \pi m}{2} + (c u - i a (m-2k)) z} \sum_{j=0}^{n} \frac{(-1)^j (c u - i a (m - 2k))^{-j-1} z^{n-j}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c u - i a (m-2k)}{2c}, \ldots, \frac{c u - i a (m-2k)}{2c}, u; \frac{c u - i a (m-2k)}{2c} + 1, \ldots, \frac{c u - i a (m-2k)}{2c} + 1; -e^{2 c z}\right) +$$

$$e^{(a i (m-2k) + c u) z - \frac{i m \pi}{2}} \sum_{j=0}^{n} \frac{(-1)^j (a i (m-2k) + c u)^{-j-1} z^{n-j}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a (m-2k) + c u}{2c}, \ldots, \frac{i a (m-2k) + c u}{2c}, u; \frac{i a (m-2k) + c u}{2c} + 1, \ldots, \frac{i a (m-2k) + c u}{2c} + 1; -e^{2 c z}\right)\Bigg) +$$

$$2^{v-m} e^{c u z} \binom{m}{\frac{m}{2}} n!\, (1 - m \bmod 2) \sum_{k=0}^{\left\lfloor \frac{1}{2}(u-v-1) \right\rfloor} (-1)^k \binom{u-v}{k} \Bigg(e^{c(-2k+u-v) z} \sum_{j=0}^{n} \frac{(-1)^j (c(-2k+2u-v))^{-j-1} z^{n-j}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{1}{2}(-2k+2u-v), \ldots, \frac{1}{2}(-2k+2u-v), u; \frac{1}{2}(-2k+2u-v)+1, \ldots, \frac{1}{2}(-2k+2u-v)+1; -e^{2 c z}\right) +$$

$$(-1)^{u-v} e^{-c(-2k+u-v) z} \sum_{j=0}^{n} \frac{(-1)^j (c(2k+v))^{-j-1} z^{n-j}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{1}{2}(2k+v), \ldots, \frac{1}{2}(2k+v), u; \frac{1}{2}(2k+v)+1, \ldots, \frac{1}{2}(2k+v)+1; -e^{2 c z}\right)\Bigg) + e^{\frac{i \pi m}{2} + c u z} 2^{v-m} n!$$

$$\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \sum_{i=0}^{\left\lfloor \frac{1}{2}(u-v-1) \right\rfloor} (-1)^i \binom{u-v}{i} \Bigg(e^{(c(-2i+u-v) - i a (m-2k)) z} \sum_{j=0}^{n} \frac{(-1)^j (c(-2i+2u-v) - i a (m-2k))^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c(-2i+2u-v) - i a (m-2k)}{2c}, \ldots, \frac{c(-2i+2u-v) - i a (m-2k)}{2c}, u; \frac{c(-2i+2u-v) - i a (m-2k)}{2c} + 1, \ldots, \frac{c(-2i+2u-v) - i a (m-2k)}{2c} + 1; -e^{2 c z}\right) +$$

$$(-1)^{u-v} e^{(-i a (m-2k) - c(-2i+u-v)) z} \sum_{j=0}^{n} \frac{(-1)^j (c(2i+v) - i a (m-2k))^{-j-1} z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\left(\frac{c(2i+v) - i a (m-2k)}{2c}, \ldots, \frac{c(2i+v) - i a (m-2k)}{2c}, u; \frac{c(2i+v) - i a (m-2k)}{2c} + 1, \ldots, \frac{c(2i+v) - i a (m-2k)}{2c} + 1; -e^{2 c z}\right)\Bigg) + 2^{v-m} e^{c u z - \frac{i m \pi}{2}} n!$$

$$\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \sum_{i=0}^{\left\lfloor \frac{1}{2}(u-v-1) \right\rfloor} (-1)^i \binom{u-v}{i} \left(e^{(a\,\mathrm{i}\,(m-2k)+c\,(-2i+u-v))\,z} \sum_{j=0}^{n} \frac{(-1)^j\,(a\,\mathrm{i}\,(m-2k)+c\,(-2i+2u-v))^{-j-1}\,z^{n-j}}{(n-j)!} \right.$$

$$ {}_{j+2}F_{j+1}\left(\frac{\mathrm{i}\,a\,(m-2k)+c\,(-2i+2u-v)}{2c}, \ldots, \frac{\mathrm{i}\,a\,(m-2k)+c\,(-2i+2u-v)}{2c}, u; \right.$$

$$\left. \frac{\mathrm{i}\,a\,(m-2k)+c\,(-2i+2u-v)}{2c}+1, \ldots, \frac{\mathrm{i}\,a\,(m-2k)+c\,(-2i+2u-v)}{2c}+1; -e^{2cz} \right) +$$

$$(-1)^{u-v}\, e^{(\mathrm{i}\,a\,(m-2k)-c\,(-2i+u-v))\,z} \sum_{j=0}^{n} \frac{(-1)^j\,(a\,\mathrm{i}\,(m-2k)+c\,(2i+v))^{-j-1}\,z^{n-j}}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\left(\frac{\mathrm{i}\,a\,(m-2k)+c\,(2i+v)}{2c}, \ldots, \frac{\mathrm{i}\,a\,(m-2k)+c\,(2i+v)}{2c}, u; \frac{\mathrm{i}\,a\,(m-2k)+c\,(2i+v)}{2c} + \right.$$

$$\left.\left. 1, \ldots, \frac{\mathrm{i}\,a\,(m-2k)+c\,(2i+v)}{2c}+1; -e^{2cz} \right)\right) /;\; n \in \mathbb{N} \land m \in \mathbb{N}^+ \land u \in \mathbb{Z} \land u \geq v \land v \in \mathbb{N}^+$$

Involving powers of cos, powers of tanh and power

Involving $z^n \cos^m(a\,z) \tanh^u(c\,z) \operatorname{sech}^\nu(c\,z)$

01.23.21.0574.01

$$\int z^n \cos^m(a\,z) \tanh^u(c\,z) \operatorname{csch}^\nu(c\,z)\, dz = \mathrm{i}^{u-v}\, 2^{v-m}\, e^{c\,u\,z} \binom{m}{\frac{m}{2}} \binom{u-v}{\frac{u-v}{2}} n!\,(1 - m \bmod 2)$$

$$(1-(u-v) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j\,(c\,u)^{-j-1}\,z^{n-j}}{(n-j)!}\; {}_{j+2}F_{j+1}\left(\frac{u}{2}, \ldots, \frac{u}{2}, u; \frac{u}{2}+1, \ldots, \frac{u}{2}+1; -e^{2cz} \right) +$$

$$\mathrm{i}^{u-v}\, 2^{v-m} \binom{u-v}{\frac{u-v}{2}} n!\,(1-(u-v) \bmod 2) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left(e^{(c\,u-\mathrm{i}\,a\,(m-2k))\,z} \sum_{j=0}^{n} \frac{(-1)^j\,(c\,u-\mathrm{i}\,a\,(m-2k))^{-j-1}\,z^{n-j}}{(n-j)!}\; {}_{j+2}F_{j+1} \right.$$

$$\left(\frac{c\,u-\mathrm{i}\,a\,(m-2k)}{2c}, \ldots, \frac{c\,u-\mathrm{i}\,a\,(m-2k)}{2c}, u; \frac{c\,u-\mathrm{i}\,a\,(m-2k)}{2c}+1, \ldots, \frac{c\,u-\mathrm{i}\,a\,(m-2k)}{2c}+1; -e^{2cz} \right) +$$

$$e^{(a\,\mathrm{i}\,(m-2k)+c\,u)\,z} \sum_{j=0}^{n} \frac{(-1)^j\,(a\,\mathrm{i}\,(m-2k)+c\,u)^{-j-1}\,z^{n-j}}{(n-j)!}\; {}_{j+2}F_{j+1}\left(\frac{\mathrm{i}\,a\,(m-2k)+c\,u}{2c}, \ldots, \right.$$

$$\left.\left. \frac{\mathrm{i}\,a\,(m-2k)+c\,u}{2c}, u; \frac{\mathrm{i}\,a\,(m-2k)+c\,u}{2c}+1, \ldots, \frac{\mathrm{i}\,a\,(m-2k)+c\,u}{2c}+1; -e^{2cz} \right)\right) +$$

$$2^{v-m}\, e^{c\,u\,z} \binom{m}{\frac{m}{2}} n!\,(1 - m \bmod 2) \sum_{k=0}^{\left\lfloor \frac{1}{2}(u-v-1) \right\rfloor} (-1)^k \binom{u-v}{k} \left(e^{c\,(-2k+u-v)\,z} \sum_{j=0}^{n} \frac{(-1)^j\,(c\,(-2k+2u-v))^{-j-1}\,z^{n-j}}{(n-j)!}\; {}_{j+2}F_{j+1} \right.$$

$$\left(\frac{1}{2}(-2k+2u-v), \ldots, \frac{1}{2}(-2k+2u-v), u; \frac{1}{2}(-2k+2u-v)+1, \ldots, \frac{1}{2}(-2k+2u-v)+1; -e^{2cz} \right) +$$

$$(-1)^{u-v}\, e^{-c\,(-2k+u-v)\,z} \sum_{j=0}^{n} \frac{(-1)^j\,(c\,(2k+v))^{-j-1}\,z^{n-j}}{(n-j)!}\; {}_{j+2}F_{j+1}\left(\frac{1}{2}(2k+v), \ldots, \frac{1}{2}(2k+v), u; \right.$$

$$\frac{1}{2}(2k+v)+1,\ \ldots,\ \frac{1}{2}(2k+v)+1;\ -e^{2cz}\Bigg)\Bigg)+e^{cuz}\,2^{v-m}\,n!$$

$$\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\sum_{i=0}^{\left\lfloor\frac{1}{2}(u-v-1)\right\rfloor}(-1)^i\binom{u-v}{i}\Bigg(e^{(c(-2i+u-v)-i a(m-2k))z}\sum_{j=0}^{n}\frac{(-1)^j\,(c(-2i+2u-v)-i a(m-2k))^{-j-1}\,z^{n-j}}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\Bigg(\frac{c(-2i+2u-v)-i a(m-2k)}{2c},\ \ldots,\ \frac{c(-2i+2u-v)-i a(m-2k)}{2c},\ u;$$

$$\frac{c(-2i+2u-v)-i a(m-2k)}{2c}+1,\ \ldots,\ \frac{c(-2i+2u-v)-i a(m-2k)}{2c}+1;\ -e^{2cz}\Bigg)+$$

$$(-1)^{u-v}\,e^{(-i a(m-2k)-c(-2i+u-v))z}\sum_{j=0}^{n}\frac{(-1)^j\,(c(2i+v)-i a(m-2k))^{-j-1}\,z^{n-j}}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\Bigg(\frac{c(2i+v)-i a(m-2k)}{2c},\ \ldots,\ \frac{c(2i+v)-i a(m-2k)}{2c},\ u;$$

$$\frac{c(2i+v)-i a(m-2k)}{2c}+1,\ \ldots,\ \frac{c(2i+v)-i a(m-2k)}{2c}+1;\ -e^{2cz}\Bigg)\Bigg)+$$

$$2^{v-m}\,e^{cuz}\,n!\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\sum_{i=0}^{\left\lfloor\frac{1}{2}(u-v-1)\right\rfloor}(-1)^i\binom{u-v}{i}\Bigg(e^{(a i(m-2k)+c(-2i+u-v))z}\sum_{j=0}^{n}\frac{(-1)^j\,(a i(m-2k)+c(-2i+2u-v))^{-j-1}\,z^{n-j}}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\Bigg(\frac{i a(m-2k)+c(-2i+2u-v)}{2c},\ \ldots,\ \frac{i a(m-2k)+c(-2i+2u-v)}{2c},\ u;$$

$$\frac{i a(m-2k)+c(-2i+2u-v)}{2c}+1,\ \ldots,\ \frac{i a(m-2k)+c(-2i+2u-v)}{2c}+1;\ -e^{2cz}\Bigg)+$$

$$(-1)^{u-v}\,e^{(i a(m-2k)-c(-2i+u-v))z}\sum_{j=0}^{n}\frac{(-1)^j\,(a i(m-2k)+c(2i+v))^{-j-1}\,z^{n-j}}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\Bigg(\frac{i a(m-2k)+c(2i+v)}{2c},\ \ldots,\ \frac{i a(m-2k)+c(2i+v)}{2c},\ u;\ \frac{i a(m-2k)+c(2i+v)}{2c}+$$

$$1,\ \ldots,\ \frac{i a(m-2k)+c(2i+v)}{2c}+1;\ -e^{2cz}\Bigg)\Bigg)\ /;\ n\in\mathbb{N}\land m\in\mathbb{N}^+\land u\in\mathbb{Z}\land u\geq v\land v\in\mathbb{N}^+$$

Involving sin, coth and power

Involving $z^n \sin(a z) \coth(c z) \operatorname{csch}^v(c z)$

01.23.21.0575.01

$$\int z^n \sin(a z) \coth(c z) \operatorname{csch}^\nu(c z)\, dz = \frac{i}{2} e^{c z} \left(1 - e^{2 c z}\right)^\nu n! \operatorname{csch}^\nu(c z) \Bigg(-e^{(-i a - c) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a + c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\!\left(\frac{-i a + c \nu}{2 c}, \ldots, \frac{-i a + c \nu}{2 c}, \nu + 1; \frac{-i a + c \nu}{2 c} + 1, \ldots, \frac{-i a + c \nu}{2 c} + 1; e^{2 c z} \right) + e^{(i a + c) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i a + c (2 + \nu))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\!\left(\frac{i a + c \nu}{2 c} + 1, \ldots, \frac{i a + c \nu}{2 c} + 1, \nu + 1; \frac{i a + c \nu}{2 c} + 2, \ldots, \frac{i a + c \nu}{2 c} + 2; e^{2 c z} \right) + e^{(i a - c) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i a + c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\!\left(\frac{i a + c \nu}{2 c}, \ldots, \frac{i a + c \nu}{2 c}, \nu + 1; \frac{i a + c \nu}{2 c} + 1, \ldots, \frac{i a + c \nu}{2 c} + 1; e^{2 c z} \right) - e^{(-i a + c) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a + c (2 + \nu))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\!\left(\frac{-i a + c \nu}{2 c} + 1, \ldots, \frac{-i a + c \nu}{2 c} + 1, \nu + 1; \frac{-i a + c \nu}{2 c} + 2, \ldots, \frac{-i a + c \nu}{2 c} + 2; e^{2 c z} \right) \Bigg) /; n \in \mathbb{N}$$

Involving powers of sin, powers of coth and power

Involving $z^n \sin^m(a z) \coth^u(c z) \operatorname{csch}^\nu(c z)$

01.23.21.0576.01

$$\int z^n \sin^m(a z) \coth^u(c z) \operatorname{csch}^\nu(c z)\, dz = 2^{-m-u} \left(1 - e^{2 c z}\right)^{u+\nu} \binom{m}{\frac{m}{2}} n! \,(1 - m \bmod 2) \operatorname{csch}^{u+\nu}(c z) \Bigg(\binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c (u+\nu))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\!\left(\frac{u+\nu}{2}, \ldots, \frac{u+\nu}{2}, u + \nu; \frac{u+\nu}{2} + 1, \ldots, \frac{u+\nu}{2} + 1; e^{2 c z} \right) + \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \Bigg(e^{-c (u - 2 s) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c (2 s + \nu))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\!\left(\frac{1}{2}(2 s + \nu), \ldots, \frac{1}{2}(2 s + \nu), u + \nu; \frac{1}{2}(2 s + \nu) + 1, \ldots, \frac{1}{2}(2 s + \nu) + 1; e^{2 c z} \right) + e^{c (u - 2 s) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c (-2 s + 2 u + \nu))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\!\left(\frac{1}{2}(-2 s + 2 u + \nu), \ldots, \frac{1}{2}(-2 s + 2 u + \nu), u + \nu; \frac{1}{2}(-2 s + 2 u + \nu) + 1, \ldots, \frac{1}{2}(-2 s + 2 u + \nu) + 1; e^{2 c z} \right) \Bigg) \Bigg) + 2^{-m-u} \left(1 - e^{2 c z}\right)^{u+\nu} n! \operatorname{csch}^{u+\nu}(c z) \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \Bigg(i^m \Bigg(e^{-i a (m - 2 k) z} \binom{u}{\frac{u}{2}} (1 - u \bmod 2)$$

$$\sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c(u+v) - i a (m-2k))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c(u+v) - i a (m-2k)}{2c}, \ldots, \frac{c(u+v) - i a (m-2k)}{2c}, u+v; \frac{c(u+v) - i a (m-2k)}{2c} + 1, \ldots, \frac{c(u+v) - i a (m-2k)}{2c} + 1; e^{2cz}\right) +$$

$$\sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(e^{(-i a (m-2k) - c(u-2s)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c(2s+v) - i a (m-2k))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c(2s+v) - i a (m-2k)}{2c}, \ldots, \frac{c(2s+v) - i a (m-2k)}{2c}, u+v; \frac{c(2s+v) - i a (m-2k)}{2c} + 1, \ldots, \frac{c(2s+v) - i a (m-2k)}{2c} + 1; e^{2cz}\right) + e^{(c(u-2s) - i a (m-2k)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (c(-2s+2u+v) - i a (m-2k))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{c(-2s+2u+v) - i a (m-2k)}{2c}, \ldots, \frac{c(-2s+2u+v) - i a (m-2k)}{2c}, u+v; \frac{c(-2s+2u+v) - i a (m-2k)}{2c} + 1, \ldots, \frac{c(-2s+2u+v) - i a (m-2k)}{2c} + 1; e^{2cz}\right)\right)\Bigg) +$$

$$i^{-m} \Bigg(e^{i a (m-2k) z} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (a i (m-2k) + c(u+v))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a (m-2k) + c(u+v)}{2c}, \ldots, \frac{i a (m-2k) + c(u+v)}{2c}, u+v; \frac{i a (m-2k) + c(u+v)}{2c} + 1, \ldots, \frac{i a (m-2k) + c(u+v)}{2c} + 1; e^{2cz}\right) +$$

$$\sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(e^{(i a (m-2k) - c(u-2s)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (a i (m-2k) + c(2s+v))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a (m-2k) + c(2s+v)}{2c}, \ldots, \frac{i a (m-2k) + c(2s+v)}{2c}, u+v; \frac{i a (m-2k) + c(2s+v)}{2c} + 1, \ldots, \frac{i a (m-2k) + c(2s+v)}{2c} + 1; e^{2cz}\right) + e^{(a i (m-2k) + c(u-2s)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (a i (m-2k) + c(-2s+2u+v))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a (m-2k) + c(-2s+2u+v)}{2c}, \ldots, \frac{i a (m-2k) + c(-2s+2u+v)}{2c}, u+v; \frac{i a (m-2k) + c(-2s+2u+v)}{2c} + 1, \ldots, \frac{i a (m-2k) + c(-2s+2u+v)}{2c} + 1; e^{2cz}\right)\right)\Bigg)\Bigg) /; n \in \mathbb{N} \land m \in \mathbb{N}^+ \land u \in \mathbb{N}^+$$

Involving cos, coth and power

Involving $z^n \cos(a z) \coth(c z) \operatorname{csch}^\nu(c z)$

01.23.21.0577.01

$$\int z^n \cos(a z) \coth(c z) \operatorname{csch}^\nu(c z)\, dz = -\frac{1}{2} e^{c z} \left(1 - e^{2 c z}\right)^\nu n! \operatorname{csch}^\nu(c z) \left(e^{(-i a - c) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (-i a + c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{-i a + c \nu}{2 c}, \ldots, \frac{-i a + c \nu}{2 c}, \nu + 1; \frac{-i a + c \nu}{2 c} + 1, \ldots, \frac{-i a + c \nu}{2 c} + 1; e^{2 c z}\right) + e^{(i a + c) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (i a + c (2 + \nu))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a + c \nu}{2 c} + 1, \ldots, \frac{i a + c \nu}{2 c} + 1, \nu + 1; \frac{i a + c \nu}{2 c} + 2, \ldots, \frac{i a + c \nu}{2 c} + 2; e^{2 c z}\right) + e^{(i a - c) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (i a + c \nu)^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{i a + c \nu}{2 c}, \ldots, \frac{i a + c \nu}{2 c}, \nu + 1; \frac{i a + c \nu}{2 c} + 1, \ldots, \frac{i a + c \nu}{2 c} + 1; e^{2 c z}\right) + e^{(-i a + c) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (-i a + c (2 + \nu))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{-i a + c \nu}{2 c} + 1, \ldots, \frac{-i a + c \nu}{2 c} + 1, \nu + 1; \frac{-i a + c \nu}{2 c} + 2, \ldots, \frac{-i a + c \nu}{2 c} + 2; e^{2 c z}\right)\right) /; n \in \mathbb{N}$$

Involving powers of cos, powers of coth and power

Involving $z^n \cos^m(a z) \coth^u(c z) \operatorname{csch}^\nu(c z)$

01.23.21.0578.01

$$\int z^n \cos^m(a z) \coth^u(c z) \operatorname{csch}^\nu(c z)\, dz = 2^{-m-u} \left(1 - e^{2 c z}\right)^{u+\nu} \binom{m}{\frac{m}{2}} n! (1 - m \bmod 2) \operatorname{csch}^{u+\nu}(c z) \left(\binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{j=0}^n \frac{(-1)^j z^{n-j} (c (u + \nu))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{u+\nu}{2}, \ldots, \frac{u+\nu}{2}, u + \nu; \frac{u+\nu}{2} + 1, \ldots, \frac{u+\nu}{2} + 1; e^{2 c z}\right) + \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(e^{-c (u - 2 s) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (c (2 s + \nu))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{1}{2}(2 s + \nu), \ldots, \frac{1}{2}(2 s + \nu), u + \nu; \frac{1}{2}(2 s + \nu) + 1, \ldots, \frac{1}{2}(2 s + \nu) + 1; e^{2 c z}\right) + e^{c (u - 2 s) z} \sum_{j=0}^n \frac{(-1)^j z^{n-j} (c (-2 s + 2 u + \nu))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\left(\frac{1}{2}(-2 s + 2 u + \nu), \ldots, \frac{1}{2}(-2 s + 2 u + \nu), u + \right.\right.$$

$$\nu;\, \frac{1}{2}(-2s+2u+\nu)+1,\, \ldots,\, \frac{1}{2}(-2s+2u+\nu)+1;\, e^{2cz}\Bigg)\Bigg)\Bigg) + 2^{-m-u}\left(1-e^{2cz}\right)^{u+\nu} n!\, \operatorname{csch}^{u+\nu}(cz)$$

$$\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\Bigg(e^{-i a(m-2k)z}\binom{u}{\frac{u}{2}}(1-u \bmod 2)\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(c(u+\nu)-i a(m-2k))^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\Bigg(\frac{c(u+\nu)-i a(m-2k)}{2c},$$

$$\ldots,\, \frac{c(u+\nu)-i a(m-2k)}{2c},\, u+\nu;\, \frac{c(u+\nu)-i a(m-2k)}{2c}+1,\, \ldots,\, \frac{c(u+\nu)-i a(m-2k)}{2c}+1;\, e^{2cz}\Bigg)+$$

$$e^{i a(m-2k)z}\binom{u}{\frac{u}{2}}(1-u \bmod 2)\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(a i(m-2k)+c(u+\nu))^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\Bigg(\frac{i a(m-2k)+c(u+\nu)}{2c},$$

$$\ldots,\, \frac{i a(m-2k)+c(u+\nu)}{2c},\, u+\nu;\, \frac{i a(m-2k)+c(u+\nu)}{2c}+1,\, \ldots,\, \frac{i a(m-2k)+c(u+\nu)}{2c}+1;\, e^{2cz}\Bigg)+$$

$$\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\Bigg(e^{(-i a(m-2k)-c(u-2s))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(c(2s+\nu)-i a(m-2k))^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\Bigg(\frac{c(2s+\nu)-i a(m-2k)}{2c},\, \ldots,$$

$$\frac{c(2s+\nu)-i a(m-2k)}{2c},\, u+\nu;\, \frac{c(2s+\nu)-i a(m-2k)}{2c}+1,\, \ldots,\, \frac{c(2s+\nu)-i a(m-2k)}{2c}+1;$$

$$e^{2cz}\Bigg)+e^{(c(u-2s)-i a(m-2k))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(c(-2s+2u+\nu)-i a(m-2k))^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}$$

$$\Bigg(\frac{c(-2s+2u+\nu)-i a(m-2k)}{2c},\, \ldots,\, \frac{c(-2s+2u+\nu)-i a(m-2k)}{2c},\, u+\nu;$$

$$\frac{c(-2s+2u+\nu)-i a(m-2k)}{2c}+1,\, \ldots,\, \frac{c(-2s+2u+\nu)-i a(m-2k)}{2c}+1;\, e^{2cz}\Bigg)\Bigg)+$$

$$\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\Bigg(e^{(i a(m-2k)-c(u-2s))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(a i(m-2k)+c(2s+\nu))^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}$$

$$\Bigg(\frac{i a(m-2k)+c(2s+\nu)}{2c},\, \ldots,\, \frac{i a(m-2k)+c(2s+\nu)}{2c},\, u+\nu;$$

$$\frac{i a(m-2k)+c(2s+\nu)}{2c}+1,\, \ldots,\, \frac{i a(m-2k)+c(2s+\nu)}{2c}+1;\, e^{2cz}\Bigg)+e^{(a i(m-2k)+c(u-2s))z}$$

$$\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}\,(a i(m-2k)+c(-2s+2u+\nu))^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\Bigg(\frac{i a(m-2k)+c(-2s+2u+\nu)}{2c},$$

$$\ldots,\, \frac{i a(m-2k)+c(-2s+2u+\nu)}{2c},\, u+\nu;\, \frac{i a(m-2k)+c(-2s+2u+\nu)}{2c}+1,$$

$$\ldots,\, \frac{i a(m-2k)+c(-2s+2u+\nu)}{2c}+1;\, e^{2cz}\Bigg)\Bigg)\Bigg)\ /;\ n\in\mathbb{N}\land m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

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 $z^n e^{pz} \sin(az)\sinh(bz)\operatorname{csch}^\nu(cz)$

01.23.21.0579.01

$$\int z^n e^{pz}\sin(az)\sinh(bz)\operatorname{csch}^\nu(cz)\,dz = \frac{i}{4}\left(1-e^{2cz}\right)^\nu \operatorname{csch}^\nu(cz)\,n!\left(-e^{(-ia-b+p)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(-ia-b+p+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{c\nu+p-ia-b}{2c},\ldots,\frac{c\nu+p-ia-b}{2c},\nu;\frac{c\nu+p-ia-b}{2c}+1,\ldots,\frac{c\nu+p-ia-b}{2c}+1;e^{2cz}\right)-e^{(ia+b+p)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(b+ia+p+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{c\nu+p+ia+b}{2c},\ldots,\frac{c\nu+p+ia+b}{2c},\nu;\frac{c\nu+p+ia+b}{2c}+1,\ldots,\frac{c\nu+p+ia+b}{2c}+1;e^{2cz}\right)+e^{(ia-b+p)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(ia-b+p+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{ia-b+p+c\nu}{2c},\ldots,\frac{ia-b+p+c\nu}{2c},\nu;\frac{ia-b+p+c\nu}{2c}+1,\ldots,\frac{ia-b+p+c\nu}{2c}+1;e^{2cz}\right)+e^{(-ia+b+p)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(-ia+b+p+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{-ia+b+p+c\nu}{2c},\ldots,\frac{-ia+b+p+c\nu}{2c},\nu;\frac{-ia+b+p+c\nu}{2c}+1,\ldots,\frac{-ia+b+p+c\nu}{2c}+1;e^{2cz}\right)\right)\;/;\;n\in\mathbb{N}$$

Involving powers of sin, powers of sinh, exp and power

Involving $z^n e^{pz} \sin^m(az)\sinh^u(bz)\operatorname{csch}^\nu(cz)$

01.23.21.0580.01

$$\int z^n e^{pz}\sin^m(az)\sinh^u(bz)\operatorname{csch}^\nu(cz)\,dz = i^u 2^{-m-u} e^{pz}\left(1-e^{2cz}\right)^\nu \binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}}\operatorname{csch}^\nu(cz)\,n!\,(1-m \bmod 2)(1-u \bmod 2)\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{c\nu+p}{2c},\ldots,\frac{c\nu+p}{2c},\nu;\frac{c\nu+p}{2c}+1,\ldots,\frac{c\nu+p}{2c}+1;e^{2cz}\right)+ i^{u+m}2^{-m-u}\binom{u}{\frac{u}{2}}(1-u \bmod 2)\left(1-e^{2cz}\right)^\nu\operatorname{csch}^\nu(cz)\,n!\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^s\binom{m}{s}\left((-1)^m e^{(p+ai(m-2s))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p+ai(m-2s)+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{p+ai(m-2s)+c\nu}{2c},\ldots,\right.\right.$$

$$\frac{p+a\,i\,(m-2\,s)+c\,\nu}{2\,c},\,\nu;\,\frac{p+a\,i\,(m-2\,s)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{p+a\,i\,(m-2\,s)+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\Bigg)+$$

$$e^{(p-i\,a\,(m-2\,s))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(p-i\,a\,(m-2\,s)+c\,\nu)^{-j-1}}{(n-j)!}\;{}_{j+2}F_{j+1}\Bigg(\frac{p-i\,a\,(m-2\,s)+c\,\nu}{2\,c},\,\ldots,$$

$$\frac{p-i\,a\,(m-2\,s)+c\,\nu}{2\,c},\,\nu;\,\frac{p-i\,a\,(m-2\,s)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{p-i\,a\,(m-2\,s)+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\Bigg)\Bigg)+$$

$$2^{-m-u}\binom{m}{\frac{m}{2}}(1-m\bmod 2)\left(1-e^{2\,c\,z}\right)^{\nu}\operatorname{csch}^{\nu}(c\,z)\,n!\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}(-1)^k\binom{u}{k}$$

$$\Bigg(e^{(p+b\,(u-2\,k))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(p+b\,(u-2\,k)+c\,\nu)^{-j-1}}{(n-j)!}\;{}_{j+2}F_{j+1}\Bigg(\frac{p+b\,(u-2\,k)+c\,\nu}{2\,c},\,\ldots,$$

$$\frac{p+b\,(u-2\,k)+c\,\nu}{2\,c},\,\nu;\,\frac{p+b\,(u-2\,k)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{p+b\,(u-2\,k)+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\Bigg)+$$

$$(-1)^u\,e^{(p-b\,(u-2\,k))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(p-b\,(u-2\,k)+c\,\nu)^{-j-1}}{(n-j)!}\;{}_{j+2}F_{j+1}\Bigg(\frac{p-b\,(u-2\,k)+c\,\nu}{2\,c},\,\ldots,\,\frac{p-b\,(u-2\,k)+c\,\nu}{2\,c},$$

$$\nu;\,\frac{p-b\,(u-2\,k)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{p-b\,(u-2\,k)+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\Bigg)\Bigg)+\,2^{-m-u}\,n!\operatorname{csch}^{\nu}(c\,z)\left(1-e^{2\,c\,z}\right)^{\nu}$$

$$\sum_{k=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}(-1)^{k+s}\binom{m}{s}\binom{u}{k}\Bigg(e^{\frac{i\,m\,\pi}{2}+(-i\,a\,(-2\,s+m)+p+b\,(-2\,k+u))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(p-i\,a\,(m-2\,s)+b\,(-2\,k+u)+c\,\nu)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{p-i\,a\,(m-2\,s)+b\,(-2\,k+u)+c\,\nu}{2\,c},\,\ldots,\,\frac{p-i\,a\,(m-2\,s)+b\,(-2\,k+u)+c\,\nu}{2\,c},\,\nu;$$

$$\frac{p-i\,a\,(m-2\,s)+b\,(-2\,k+u)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{p-i\,a\,(m-2\,s)+b\,(-2\,k+u)+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\Bigg)+$$

$$(-1)^u\,e^{-\frac{1}{2}\,i\,m\,\pi+(i\,a\,(-2\,s+m)+p-b\,(-2\,k+u))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(p+i\,a\,(m-2\,s)-b\,(-2\,k+u)+c\,\nu)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{p+i\,a\,(m-2\,s)-b\,(-2\,k+u)+c\,\nu}{2\,c},\,\ldots,\,\frac{p+i\,a\,(m-2\,s)-b\,(-2\,k+u)+c\,\nu}{2\,c},\,\nu;$$

$$\frac{p+i\,a\,(m-2\,s)-b\,(-2\,k+u)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{p+i\,a\,(m-2\,s)-b\,(-2\,k+u)+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\Bigg)+$$

$$(-1)^u\,e^{\frac{i\,m\,\pi}{2}+(-i\,a\,(-2\,s+m)+p-b\,(-2\,k+u))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(p-i\,a\,(m-2\,s)-b\,(-2\,k+u)+c\,\nu)^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{p-i\,a\,(m-2\,s)-b\,(-2\,k+u)+c\,\nu}{2\,c},\,\ldots,\,\frac{p-i\,a\,(m-2\,s)-b\,(-2\,k+u)+c\,\nu}{2\,c},\,\nu;$$

$$\frac{p-i\,a\,(m-2\,s)-b\,(-2\,k+u)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{p-i\,a\,(m-2\,s)-b\,(-2\,k+u)+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\Bigg)+$$

$$e^{-\frac{1}{2} i m \pi+(i a(-2 s+m)+p+b(-2 k+u)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+i a(m-2 s)+b(-2 k+u)+c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{p+i a(m-2 s)+b(-2 k+u)+c \nu}{2 c}, \ldots, \frac{p+i a(m-2 s)+b(-2 k+u)+c \nu}{2 c}, \nu; \frac{p+i a(m-2 s)+b(-2 k+u)+c \nu}{2 c}+1, \ldots, \frac{p+i a(m-2 s)+b(-2 k+u)+c \nu}{2 c}+1; e^{2 c z}\right)\Bigg) /; n \in \mathbb{N} \bigwedge m \in \mathbb{N}^+ \bigwedge u \in \mathbb{N}^+$$

Involving cos, sinh, exp and power

Involving $z^n e^{p z} \cos(a z) \sinh(b z) \operatorname{csch}^{\nu}(c z)$

01.23.21.0581.01

$$\int z^n e^{p z} \cos(a z) \sinh(b z) \operatorname{csch}^{\nu}(c z) \, dz = \frac{1}{4} \left(1-e^{2 c z}\right)^{\nu} \operatorname{csch}^{\nu}(c z)\, n! \Bigg(-e^{(-i a-b+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a-b+p+c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c \nu+p-i a-b}{2 c}, \ldots, \frac{c \nu+p-i a-b}{2 c}, \nu; \frac{c \nu+p-i a-b}{2 c}+1, \ldots, \frac{c \nu+p-i a-b}{2 c}+1; e^{2 c z}\right)+$$
$$e^{(i a+b+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (b+i a+p+c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{c \nu+p+i a+b}{2 c}, \ldots, \frac{c \nu+p+i a+b}{2 c}, \nu; \frac{c \nu+p+i a+b}{2 c}+1, \ldots, \frac{c \nu+p+i a+b}{2 c}+1; e^{2 c z}\right)-e^{(i a-b+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (i a-b+p+c \nu)^{-j-1}}{(n-j)!}$$
$${}_{j+2}F_{j+1}\left(\frac{i a-b+p+c \nu}{2 c}, \ldots, \frac{i a-b+p+c \nu}{2 c}, \nu; \frac{i a-b+p+c \nu}{2 c}+1, \ldots, \frac{i a-b+p+c \nu}{2 c}+1; e^{2 c z}\right)+$$
$$e^{(-i a+b+p) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a+b+p+c \nu)^{-j-1}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{-i a+b+p+c \nu}{2 c}, \ldots, \frac{-i a+b+p+c \nu}{2 c}, \nu; \frac{-i a+b+p+c \nu}{2 c}+1, \ldots, \frac{-i a+b+p+c \nu}{2 c}+1; e^{2 c z}\right)\Bigg) /; n \in \mathbb{N}$$

Involving powers of cos, powers of sinh, exp and power

Involving $z^n e^{p z} \cos^m(a z) \sinh^u(b z) \operatorname{csch}^{\nu}(c z)$

01.23.21.0582.01

$$\int z^n e^{pz} \cos^m(a z) \sinh^u(b z) \operatorname{csch}^\nu(c z)\, dz = i^u\, 2^{-m-u}\, e^{pz} \left(1 - e^{2cz}\right)^\nu \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} \operatorname{csch}^\nu(c z)\, n!\, (1 - m \bmod 2)\, (1 - u \bmod 2)$$
$$\sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p + c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu + p}{2c}, \ldots, \frac{c\nu + p}{2c}, \nu; \frac{c\nu + p}{2c} + 1, \ldots, \frac{c\nu + p}{2c} + 1; e^{2cz}\right) +$$
$$i^u\, 2^{-m-u} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) \left(1 - e^{2cz}\right)^\nu \operatorname{csch}^\nu(c z)\, n!$$
$$\sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{s} \Bigg(e^{(p + a i (m-2s)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p + a i (m-2s) + c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\Bigg(\frac{p + a i (m-2s) + c\nu}{2c}, \ldots,$$
$$\frac{p + a i (m-2s) + c\nu}{2c}, \nu; \frac{p + a i (m-2s) + c\nu}{2c} + 1, \ldots, \frac{p + a i (m-2s) + c\nu}{2c} + 1; e^{2cz}\Bigg) +$$
$$e^{(p - i a (m-2s)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p - i a (m-2s) + c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\Bigg(\frac{p - i a (m-2s) + c\nu}{2c}, \ldots,$$
$$\frac{p - i a (m-2s) + c\nu}{2c}, \nu; \frac{p - i a (m-2s) + c\nu}{2c} + 1, \ldots, \frac{p - i a (m-2s) + c\nu}{2c} + 1; e^{2cz}\Bigg)\Bigg) +$$
$$2^{-m-u} \binom{m}{\frac{m}{2}} (1 - m \bmod 2) \left(1 - e^{2cz}\right)^\nu \operatorname{csch}^\nu(c z)\, n! \sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{u}{k}$$
$$\Bigg(e^{(p + b(u-2k)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p + b(u-2k) + c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\Bigg(\frac{p + b(u-2k) + c\nu}{2c}, \ldots,$$
$$\frac{p + b(u-2k) + c\nu}{2c}, \nu; \frac{p + b(u-2k) + c\nu}{2c} + 1, \ldots, \frac{p + b(u-2k) + c\nu}{2c} + 1; e^{2cz}\Bigg) +$$
$$(-1)^u e^{(p - b(u-2k)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p - b(u-2k) + c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\Bigg(\frac{p - b(u-2k) + c\nu}{2c}, \ldots, \frac{p - b(u-2k) + c\nu}{2c},$$
$$\nu; \frac{p - b(u-2k) + c\nu}{2c} + 1, \ldots, \frac{p - b(u-2k) + c\nu}{2c} + 1; e^{2cz}\Bigg)\Bigg) + 2^{-m-u}\, n!\, \operatorname{csch}^\nu(c z) \left(1 - e^{2cz}\right)^\nu$$
$$\sum_{k=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \sum_{s=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{s} \binom{u}{k} \Bigg(e^{(p - i a (m-2s) + b(u-2k)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p - i a (m-2s) + b(-2k+u) + c\nu)^{-j-1}}{(n-j)!}$$
$${}_{j+2}F_{j+1}\Bigg(\frac{p - i a (m-2s) + b(-2k+u) + c\nu}{2c}, \ldots, \frac{p - i a (m-2s) + b(-2k+u) + c\nu}{2c}, \nu;$$
$$\frac{p - i a (m-2s) + b(-2k+u) + c\nu}{2c} + 1, \ldots, \frac{p - i a (m-2s) + b(-2k+u) + c\nu}{2c} + 1; e^{2cz}\Bigg) +$$
$$(-1)^u e^{(p + a i (m-2s) - b(u-2k)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p + i a (m-2s) - b(-2k+u) + c\nu)^{-j-1}}{(n-j)!}$$
$${}_{j+2}F_{j+1}\Bigg(\frac{p + i a (m-2s) - b(-2k+u) + c\nu}{2c}, \ldots, \frac{p + i a (m-2s) - b(-2k+u) + c\nu}{2c}, \nu;$$

$$\frac{p+i\,a\,(m-2\,s)-b\,(-2\,k+u)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{p+i\,a\,(m-2\,s)-b\,(-2\,k+u)+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\Bigg)+$$

$$(-1)^u\,e^{(p-i\,a\,(m-2\,s)-b\,(u-2\,k))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(p-i\,a\,(m-2\,s)-b\,(-2\,k+u)+c\,\nu)^{-j-1}}{(n-j)!}$$

$$_{j+2}F_{j+1}\Bigg(\frac{p-i\,a\,(m-2\,s)-b\,(-2\,k+u)+c\,\nu}{2\,c},\,\ldots,\,\frac{p-i\,a\,(m-2\,s)-b\,(-2\,k+u)+c\,\nu}{2\,c},\,\nu;$$

$$\frac{p-i\,a\,(m-2\,s)-b\,(-2\,k+u)+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{p-i\,a\,(m-2\,s)-b\,(-2\,k+u)+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\Bigg)+$$

$$e^{(p+a\,i\,(m-2\,s)+b\,(u-2\,k))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(p+i\,a\,(m-2\,s)+b\,(-2\,k+u)+c\,\nu)^{-j-1}}{(n-j)!}$$

$$_{j+2}F_{j+1}\Bigg(\frac{p+i\,a\,(m-2\,s)+b\,(-2\,k+u)+c\,\nu}{2\,c},\,\ldots,\,\frac{p+i\,a\,(m-2\,s)+b\,(-2\,k+u)+c\,\nu}{2\,c},$$

$$\nu;\,\frac{p+i\,a\,(m-2\,s)+b\,(-2\,k+u)+c\,\nu}{2\,c}+1,\,\ldots,$$

$$\frac{p+i\,a\,(m-2\,s)+b\,(-2\,k+u)+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\Bigg)\Bigg)\,/;\,n\in\mathbb{N}\land m\in\mathbb{N}^+\land u\in\mathbb{N}^+$$

Involving sin, cosh, exp and power

Involving $z^n\,e^{p\,z}\,\sin(a\,z)\cosh(b\,z)\,\operatorname{csch}^\nu(c\,z)$

01.23.21.0583.01

$$\int z^n\,e^{p\,z}\,\sin(a\,z)\cosh(b\,z)\operatorname{csch}^\nu(c\,z)\,dz=$$

$$\frac{i}{4}\left(1-e^{2\,c\,z}\right)^\nu\operatorname{csch}^\nu(c\,z)\,n!\Bigg(e^{(-i\,a-b+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(-i\,a-b+p+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\Bigg(\frac{c\,\nu+p-i\,a-b}{2\,c},$$

$$\ldots,\,\frac{c\,\nu+p-i\,a-b}{2\,c},\,\nu;\,\frac{c\,\nu+p-i\,a-b}{2\,c}+1,\,\ldots,\,\frac{c\,\nu+p-i\,a-b}{2\,c}+1;\,e^{2\,c\,z}\Bigg)-$$

$$e^{(i\,a+b+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(b+i\,a+p+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\Bigg(\frac{c\,\nu+p+i\,a+b}{2\,c},\,\ldots,\,\frac{c\,\nu+p+i\,a+b}{2\,c},\,\nu;$$

$$\frac{c\,\nu+p+i\,a+b}{2\,c}+1,\,\ldots,\,\frac{c\,\nu+p+i\,a+b}{2\,c}+1;\,e^{2\,c\,z}\Bigg)-e^{(i\,a-b+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(i\,a-b+p+c\,\nu)^{-j-1}}{(n-j)!}$$

$$_{j+2}F_{j+1}\Bigg(\frac{i\,a-b+p+c\,\nu}{2\,c},\,\ldots,\,\frac{i\,a-b+p+c\,\nu}{2\,c},\,\nu;\,\frac{i\,a-b+p+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{i\,a-b+p+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\Bigg)+$$

$$e^{(-i\,a+b+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(-i\,a+b+p+c\,\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\Bigg(\frac{-i\,a+b+p+c\,\nu}{2\,c},\,\ldots,\,\frac{-i\,a+b+p+c\,\nu}{2\,c},$$

$$\nu;\,\frac{-i\,a+b+p+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{-i\,a+b+p+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\Bigg)\Bigg)\,/;\,n\in\mathbb{N}$$

Involving powers of sin, powers of cosh, exp and power

Involving $z^n e^{pz} \sin^m(az) \cosh^u(bz) \operatorname{csch}^\nu(cz)$

01.23.21.0584.01

$$\int z^n e^{pz} \sin^m(az) \cosh^u(bz) \operatorname{csch}^\nu(cz)\,dz = 2^{-m-u} e^{pz} \left(1-e^{2cz}\right)^\nu \binom{m}{\frac{m}{2}} \binom{u}{\frac{u}{2}} n!\,(1-m \bmod 2)(1-u \bmod 2)$$
$$\operatorname{csch}^\nu(cz) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu+p}{2c}, \ldots, \frac{c\nu+p}{2c}, \nu; \frac{c\nu+p}{2c}+1, \ldots, \frac{c\nu+p}{2c}+1; e^{2cz}\right) +$$
$$2^{-m-u} \left(1-e^{2cz}\right)^\nu \binom{u}{\frac{u}{2}} n!\,(1-u \bmod 2) \operatorname{csch}^\nu(cz)$$
$$\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \Bigg(e^{(a i (m-2k)+p) z - \frac{i m \pi}{2}} \sum_{j=0}^{n} \frac{1}{(n-j)!} (-1)^j z^{n-j} (a i (m-2k)+p+c\nu)^{-j-1}\, {}_{j+2}F_{j+1}\Bigg(\frac{a i (m-2k)+p+c\nu}{2c}, \ldots,$$
$$\frac{a i (m-2k)+p+c\nu}{2c}, \nu; \frac{a i (m-2k)+p+c\nu}{2c}+1, \ldots, \frac{a i (m-2k)+p+c\nu}{2c}+1; e^{2cz}\Bigg) +$$
$$e^{\frac{i \pi m}{2}+(p-i a (m-2k)) z} \sum_{j=0}^{n} \frac{1}{(n-j)!} (-1)^j z^{n-j} (-i a (m-2k)+p+c\nu)^{-j-1}\, {}_{j+2}F_{j+1}\Bigg(\frac{-i a (m-2k)+p+c\nu}{2c},$$
$$\ldots, \frac{-i a (m-2k)+p+c\nu}{2c}, \nu; \frac{-i a (m-2k)+p+c\nu}{2c}+1, \ldots, \frac{-i a (m-2k)+p+c\nu}{2c}+1; e^{2cz}\Bigg)\Bigg) -$$
$$2^{-m-u} \binom{m}{\frac{m}{2}} (m \bmod 2 - 1) \left(1-e^{2cz}\right)^\nu n! \operatorname{csch}^\nu(cz) \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \Bigg(e^{(p+b(u-2s))z} \sum_{j=0}^{n} \frac{1}{(n-j)!} (-1)^j z^{n-j}$$
$$(p+b(u-2s)+c\nu)^{-j-1}\, {}_{j+2}F_{j+1}\Bigg(\frac{p+b(u-2s)+c\nu}{2c}, \ldots, \frac{p+b(u-2s)+c\nu}{2c},$$
$$\nu; \frac{p+b(u-2s)+c\nu}{2c}+1, \ldots, \frac{p+b(u-2s)+c\nu}{2c}+1; e^{2cz}\Bigg) + e^{(p-b(u-2s))z}$$
$$\sum_{j=0}^{n} \frac{1}{(n-j)!} (-1)^j z^{n-j} (p-b(u-2s)+c\nu)^{-j-1}\, {}_{j+2}F_{j+1}\Bigg(\frac{p-b(u-2s)+c\nu}{2c}, \ldots, \frac{p-b(u-2s)+c\nu}{2c},$$
$$\nu; \frac{p-b(u-2s)+c\nu}{2c}+1, \ldots, \frac{p-b(u-2s)+c\nu}{2c}+1; e^{2cz}\Bigg)\Bigg) + 2^{-m-u} \left(1-e^{2cz}\right)^\nu n! \operatorname{csch}^\nu(cz)$$
$$\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \binom{u}{s} \Bigg(e^{(a i (m-2k)+p-b(u-2s)) z - \frac{i m \pi}{2}} \sum_{j=0}^{n} \frac{1}{(n-j)!} (-1)^j z^{n-j} (a i (m-2k)+p-b(u-2s)+c\nu)^{-j-1}$$
$${}_{j+2}F_{j+1}\Bigg(\frac{a i (m-2k)+p-b(u-2s)+c\nu}{2c}, \ldots, \frac{a i (m-2k)+p-b(u-2s)+c\nu}{2c}, \nu;$$
$$\frac{a i (m-2k)+p-b(u-2s)+c\nu}{2c}+1, \ldots, \frac{a i (m-2k)+p-b(u-2s)+c\nu}{2c}+1; e^{2cz}\Bigg) +$$

$$e^{\frac{i\pi m}{2}+(-i\,a\,(m-2k)+p+b\,(u-2s))\,z}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^j z^{n-j}\,(-i\,a\,(m-2k)+p+b\,(u-2s)+c\,\nu)^{-j-1}$$
$$_{j+2}F_{j+1}\Bigg(\frac{-a\,i\,(m-2k)+p+b\,(u-2s)+c\,\nu}{2c},\ldots,\frac{-a\,i\,(m-2k)+p+b\,(u-2s)+c\,\nu}{2c},\nu;$$
$$\frac{-a\,i\,(m-2k)+p+b\,(u-2s)+c\,\nu}{2c}+1,\ldots,\frac{-a\,i\,(m-2k)+p+b\,(u-2s)+c\,\nu}{2c}+1;e^{2cz}\Bigg)+$$
$$e^{\frac{i\pi m}{2}+(-i\,a\,(m-2k)+p-b\,(u-2s))\,z}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^j z^{n-j}\,(-i\,a\,(m-2k)+p-b\,(u-2s)+c\,\nu)^{-j-1}$$
$$_{j+2}F_{j+1}\Bigg(\frac{-a\,i\,(m-2k)+p-b\,(u-2s)+c\,\nu}{2c},\ldots,\frac{-a\,i\,(m-2k)+p-b\,(u-2s)+c\,\nu}{2c},\nu;$$
$$\frac{-a\,i\,(m-2k)+p-b\,(u-2s)+c\,\nu}{2c}+1,\ldots,\frac{-a\,i\,(m-2k)+p-b\,(u-2s)+c\,\nu}{2c}+1;e^{2cz}\Bigg)+$$
$$e^{(a\,i\,(m-2k)+p+b\,(u-2s))\,z-\frac{i\,m\pi}{2}}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^j z^{n-j}\,(a\,i\,(m-2k)+p+b\,(u-2s)+c\,\nu)^{-j-1}$$
$$_{j+2}F_{j+1}\Bigg(\frac{a\,i\,(m-2k)+p+b\,(u-2s)+c\,\nu}{2c},\ldots,\frac{a\,i\,(m-2k)+p+b\,(u-2s)+c\,\nu}{2c},$$
$$\nu;\frac{a\,i\,(m-2k)+p+b\,(u-2s)+c\,\nu}{2c}+1,\ldots,$$
$$\frac{a\,i\,(m-2k)+p+b\,(u-2s)+c\,\nu}{2c}+1;e^{2cz}\Bigg)\Bigg)\Bigg)\,/;\,n\in\mathbb{N}\bigwedge m\in\mathbb{N}^+\bigwedge u\in\mathbb{N}^+$$

Involving cos, cosh, exp and power

Involving $z^n\, e^{p\,z}\cos(a\,z)\cosh(b\,z)\,\mathrm{csch}^{\nu}(c\,z)$

01.23.21.0585.01

$$\int z^n e^{pz} \cos(az)\cosh(bz)\operatorname{csch}^\nu(cz)\,dz = \frac{1}{4}\left(1-e^{2cz}\right)^\nu \operatorname{csch}^\nu(cz)\, n!\left(e^{(-ia-b+p)z}\sum_{j=0}^n \frac{(-1)^j z^{n-j}(-ia-b+p+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu+p-ia-b}{2c}, \ldots, \frac{c\nu+p-ia-b}{2c}, \nu; \frac{c\nu+p-ia-b}{2c}+1, \ldots, \frac{c\nu+p-ia-b}{2c}+1; e^{2cz}\right) + e^{(ia+b+p)z}\sum_{j=0}^n \frac{(-1)^j z^{n-j}(b+ia+p+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu+p+ia+b}{2c}, \ldots, \frac{c\nu+p+ia+b}{2c}, \nu; \frac{c\nu+p+ia+b}{2c}+1, \ldots, \frac{c\nu+p+ia+b}{2c}+1; e^{2cz}\right) + e^{(ia-b+p)z}\sum_{j=0}^n \frac{(-1)^j z^{n-j}(ia-b+p+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{ia-b+p+c\nu}{2c}, \ldots, \frac{ia-b+p+c\nu}{2c}, \nu; \frac{ia-b+p+c\nu}{2c}+1, \ldots, \frac{ia-b+p+c\nu}{2c}+1; e^{2cz}\right) + e^{(-ia+b+p)z}\sum_{j=0}^n \frac{(-1)^j z^{n-j}(-ia+b+p+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{-ia+b+p+c\nu}{2c}, \ldots, \frac{-ia+b+p+c\nu}{2c}, \nu; \frac{-ia+b+p+c\nu}{2c}+1, \ldots, \frac{-ia+b+p+c\nu}{2c}+1; e^{2cz}\right)\right) /; n \in \mathbb{N}$$

Involving powers of cos, powers of cosh, exp and power

Involving $z^n e^{pz} \cos^m(az)\cosh^u(bz)\operatorname{csch}^\nu(cz)$

01.23.21.0586.01

$$\int z^n e^{pz} \cos^m(az)\cosh^u(bz)\operatorname{csch}^\nu(cz)\,dz = 2^{-m-u} e^{pz}\left(1-e^{2cz}\right)^\nu \binom{m}{\frac{m}{2}}\binom{u}{\frac{u}{2}} n!\,(1-m \bmod 2)(1-u \bmod 2) \operatorname{csch}^\nu(cz)\sum_{j=0}^n \frac{(-1)^j z^{n-j}(p+c\nu)^{-j-1}}{(n-j)!}\, {}_{j+2}F_{j+1}\left(\frac{c\nu+p}{2c}, \ldots, \frac{c\nu+p}{2c}, \nu; \frac{c\nu+p}{2c}+1, \ldots, \frac{c\nu+p}{2c}+1; e^{2cz}\right) + 2^{-m-u}\left(1-e^{2cz}\right)^\nu \binom{u}{\frac{u}{2}} n!\,(1-u \bmod 2)\operatorname{csch}^\nu(cz) \sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\left(e^{(ai(m-2k)+p)z}\sum_{j=0}^n \frac{1}{(n-j)!}(-1)^j z^{n-j}(ai(m-2k)+p+c\nu)^{-j-1}\, {}_{j+2}F_{j+1}\left(\frac{ai(m-2k)+p+c\nu}{2c}, \ldots, \frac{ai(m-2k)+p+c\nu}{2c}, \nu; \frac{ai(m-2k)+p+c\nu}{2c}+1, \ldots, \frac{ai(m-2k)+p+c\nu}{2c}+1; e^{2cz}\right) + e^{(p-ia(m-2k))z}\sum_{j=0}^n \frac{1}{(n-j)!}(-1)^j z^{n-j}(-ia(m-2k)+p+c\nu)^{-j-1}\, {}_{j+2}F_{j+1}\left(\frac{-ia(m-2k)+p+c\nu}{2c}, \ldots, \frac{-ia(m-2k)+p+c\nu}{2c}, \nu; \frac{-ia(m-2k)+p+c\nu}{2c}+1, \ldots, \frac{-ia(m-2k)+p+c\nu}{2c}+1; e^{2cz}\right)\right) -$$

$$2^{-m-u}\binom{m}{\frac{m}{2}}(m \bmod 2-1)\left(1-e^{2cz}\right)^{\nu} n!\,\operatorname{csch}^{\nu}(cz)\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(e^{(p+b(u-2s))z}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^j z^{n-j}\right.$$

$$(p+b(u-2s)+c\nu)^{-j-1}\,{}_{j+2}F_{j+1}\left(\frac{p+b(u-2s)+c\nu}{2c},\ldots,\frac{p+b(u-2s)+c\nu}{2c},\right.$$

$$\left.\nu;\frac{p+b(u-2s)+c\nu}{2c}+1,\ldots,\frac{p+b(u-2s)+c\nu}{2c}+1;e^{2cz}\right)+e^{(p-b(u-2s))z}$$

$$\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^j z^{n-j}(p-b(u-2s)+c\nu)^{-j-1}\,{}_{j+2}F_{j+1}\left(\frac{p-b(u-2s)+c\nu}{2c},\ldots,\frac{p-b(u-2s)+c\nu}{2c},\right.$$

$$\left.\left.\nu;\frac{p-b(u-2s)+c\nu}{2c}+1,\ldots,\frac{p-b(u-2s)+c\nu}{2c}+1;e^{2cz}\right)\right)+2^{-m-u}\left(1-e^{2cz}\right)^{\nu}n!\,\operatorname{csch}^{\nu}(cz)$$

$$\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{m}{k}\binom{u}{s}\left(e^{(ai(m-2k)+p-b(u-2s))z}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^j z^{n-j}(ai(m-2k)+p-b(u-2s)+c\nu)^{-j-1}\right.$$

$${}_{j+2}F_{j+1}\left(\frac{ai(m-2k)+p-b(u-2s)+c\nu}{2c},\ldots,\frac{ai(m-2k)+p-b(u-2s)+c\nu}{2c},\nu;\right.$$

$$\left.\frac{ai(m-2k)+p-b(u-2s)+c\nu}{2c}+1,\ldots,\frac{ai(m-2k)+p-b(u-2s)+c\nu}{2c}+1;e^{2cz}\right)+$$

$$e^{(-ia(m-2k)+p+b(u-2s))z}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^j z^{n-j}(-ia(m-2k)+p+b(u-2s)+c\nu)^{-j-1}$$

$${}_{j+2}F_{j+1}\left(\frac{-ai(m-2k)+p+b(u-2s)+c\nu}{2c},\ldots,\frac{-ai(m-2k)+p+b(u-2s)+c\nu}{2c},\nu;\right.$$

$$\left.\frac{-ai(m-2k)+p+b(u-2s)+c\nu}{2c}+1,\ldots,\frac{-ai(m-2k)+p+b(u-2s)+c\nu}{2c}+1;e^{2cz}\right)+$$

$$e^{(-ia(m-2k)+p-b(u-2s))z}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^j z^{n-j}(-ia(m-2k)+p-b(u-2s)+c\nu)^{-j-1}$$

$${}_{j+2}F_{j+1}\left(\frac{-ai(m-2k)+p-b(u-2s)+c\nu}{2c},\ldots,\frac{-ai(m-2k)+p-b(u-2s)+c\nu}{2c},\nu;\right.$$

$$\left.\frac{-ai(m-2k)+p-b(u-2s)+c\nu}{2c}+1,\ldots,\frac{-ai(m-2k)+p-b(u-2s)+c\nu}{2c}+1;e^{2cz}\right)+$$

$$e^{(ai(m-2k)+p+b(u-2s))z}\sum_{j=0}^{n}\frac{1}{(n-j)!}(-1)^j z^{n-j}(ai(m-2k)+p+b(u-2s)+c\nu)^{-j-1}$$

$${}_{j+2}F_{j+1}\left(\frac{ai(m-2k)+p+b(u-2s)+c\nu}{2c},\ldots,\frac{ai(m-2k)+p+b(u-2s)+c\nu}{2c},\right.$$

$$\nu;\frac{ai(m-2k)+p+b(u-2s)+c\nu}{2c}+1,\ldots,$$

$$\left.\left.\frac{ai(m-2k)+p+b(u-2s)+c\nu}{2c}+1;e^{2cz}\right)\right)\;/;\;n\in\mathbb{N}\bigwedge m\in\mathbb{N}^+\bigwedge u\in\mathbb{N}^+$$

Involving powers of sin, powers of tanh, exp and power

Involving $z^n\, e^{p z} \sin^m(a z) \tanh^u(c z) \operatorname{csch}^v(c z)$

01.23.21.0587.01

$$\int z^n e^{p z} \sin^m(a z) \tanh^u(c z) \operatorname{csch}^v(c z)\, dz ==$$

$$i^{u-v}\, 2^{v-m}\, e^{(p+c u) z} \binom{m}{\frac{m}{2}} \binom{u-v}{\frac{u-v}{2}} n!\, (1 - m \bmod 2)\, (1 - (u-v) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j\, (p+c u)^{-j-1}\, z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\!\left(\frac{p+c u}{2 c}, \ldots, \frac{p+c u}{2 c}, u; \frac{p+c u}{2 c}+1, \ldots, \frac{p+c u}{2 c}+1; -e^{2 c z}\right) + i^{u-v}\, 2^{v-m} \binom{u-v}{\frac{u-v}{2}} n!\, (1 - (u-v) \bmod 2)$$

$$\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \Bigg(e^{\frac{i \pi m}{2} + (-i a (m-2 k)+p+c u) z} \sum_{j=0}^{n} \frac{(-1)^j\, (-i a (m-2 k)+p+c u)^{-j-1}\, z^{n-j}}{(n-j)!}\; {}_{j+2}F_{j+1}\Bigg(\frac{-i a (m-2 k)+p+c u}{2 c},$$

$$\ldots, \frac{-i a (m-2 k)+p+c u}{2 c}, u; \frac{-i a (m-2 k)+p+c u}{2 c}+1, \ldots, \frac{-i a (m-2 k)+p+c u}{2 c}+1; -e^{2 c z}\Bigg) +$$

$$e^{(a i (m-2 k)+p+c u) z - \frac{i m \pi}{2}} \sum_{j=0}^{n} \frac{(-1)^j\, (a i (m-2 k)+p+c u)^{-j-1}\, z^{n-j}}{(n-j)!}\; {}_{j+2}F_{j+1}\Bigg(\frac{i a (m-2 k)+p+c u}{2 c}, \ldots,$$

$$\frac{i a (m-2 k)+p+c u}{2 c}, u; \frac{i a (m-2 k)+p+c u}{2 c}+1, \ldots, \frac{i a (m-2 k)+p+c u}{2 c}+1; -e^{2 c z}\Bigg)\Bigg) +$$

$$2^{v-m}\, e^{c u z} \binom{m}{\frac{m}{2}} n!\, (1 - m \bmod 2) \sum_{k=0}^{\left\lfloor \frac{1}{2} (u-v-1) \right\rfloor} (-1)^k \binom{u-v}{k} \Bigg(e^{(p+c(-2 k+u-v)) z} \sum_{j=0}^{n} \frac{(-1)^j\, (p+c(-2 k+2 u-v))^{-j-1}\, z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{p+c(-2 k+2 u-v)}{2 c}, \ldots, \frac{p+c(-2 k+2 u-v)}{2 c}, u; \frac{p+c(-2 k+2 u-v)}{2 c}+1, \ldots,$$

$$\frac{p+c(-2 k+2 u-v)}{2 c}+1; -e^{2 c z}\Bigg) + (-1)^{u-v}\, e^{(p-c(-2 k+u-v)) z} \sum_{j=0}^{n} \frac{(-1)^j\, (p+c(2 k+v))^{-j-1}\, z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{p+c(2 k+v)}{2 c}, \ldots, \frac{p+c(2 k+v)}{2 c}, u; \frac{p+c(2 k+v)}{2 c}+1, \ldots, \frac{p+c(2 k+v)}{2 c}+1; -e^{2 c z}\Bigg)\Bigg) +$$

$$e^{\frac{i \pi m}{2} + c u z}\, 2^{v-m}\, n! \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \sum_{i=0}^{\left\lfloor \frac{1}{2} (u-v-1) \right\rfloor} (-1)^i \binom{u-v}{i} \Bigg(e^{(-i a (m-2 k)+p+c(-2 i+u-v)) z}$$

$$\sum_{j=0}^{n} \frac{(-1)^j\, (-i a (m-2 k)+p+c(-2 i+2 u-v))^{-j-1}\, z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{-i a (m-2 k)+p+c(-2 i+2 u-v)}{2 c}, \ldots, \frac{-i a (m-2 k)+p+c(-2 i+2 u-v)}{2 c}, u;$$

$$\frac{-i a (m-2 k)+p+c(-2 i+2 u-v)}{2 c}+1, \ldots, \frac{-i a (m-2 k)+p+c(-2 i+2 u-v)}{2 c}+1; -e^{2 c z}\Bigg) +$$

$$(-1)^{u-v} e^{(-i a (m-2k)+p-c(-2i+u-v))z} \sum_{j=0}^{n} \frac{(-1)^j (-i a (m-2k)+p+c(2i+v))^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{-i a (m-2k)+p+c(2i+v)}{2c}, \ldots, \frac{-i a (m-2k)+p+c(2i+v)}{2c}, u; \frac{-i a (m-2k)+p+c(2i+v)}{2c}+1, \ldots, \frac{-i a (m-2k)+p+c(2i+v)}{2c}+1; -e^{2cz}\right)\Bigg) +$$

$$2^{v-m} e^{c u z - \frac{i m \pi}{2}} n! \sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \sum_{i=0}^{\left\lfloor \frac{1}{2}(u-v-1) \right\rfloor} (-1)^i \binom{u-v}{i} \Bigg(e^{(a i (m-2k)+p+c(-2i+u-v))z} \sum_{j=0}^{n} \frac{(-1)^j (a i (m-2k)+p+c(-2i+2u-v))^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{i a (m-2k)+p+c(-2i+2u-v)}{2c}, \ldots, \frac{i a (m-2k)+p+c(-2i+2u-v)}{2c}, u; \frac{i a (m-2k)+p+c(-2i+2u-v)}{2c}+1, \ldots, \frac{i a (m-2k)+p+c(-2i+2u-v)}{2c}+1; -e^{2cz}\right) +$$

$$(-1)^{u-v} e^{(a i (m-2k)+p-c(-2i+u-v))z} \sum_{j=0}^{n} \frac{(-1)^j (a i (m-2k)+p+c(2i+v))^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{i a (m-2k)+p+c(2i+v)}{2c}, \ldots, \frac{i a (m-2k)+p+c(2i+v)}{2c}, u; \frac{i a (m-2k)+p+c(2i+v)}{2c} + 1, \ldots, \frac{i a (m-2k)+p+c(2i+v)}{2c}+1; -e^{2cz}\right)\Bigg) /; n \in \mathbb{N} \land m \in \mathbb{N}^+ \land u \in \mathbb{Z} \land u \geq v \land v \in \mathbb{N}^+$$

Involving powers of cos, powers of tanh, exp and power

Involving $z^n e^{p z} \cos^m(a z) \tanh^u(c z) \operatorname{csch}^v(c z)$

01.23.21.0588.01

$$\int z^n e^{p z} \cos^m(a z) \tanh^u(c z) \operatorname{csch}^v(c z)\, dz =$$

$$i^{u-v} 2^{v-m} e^{(p+c u) z} \binom{m}{\frac{m}{2}} \binom{u-v}{\frac{u-v}{2}} n! (1 - m \bmod 2)(1 - (u-v) \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j (p+c u)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{p+c u}{2c}, \ldots, \frac{p+c u}{2c}, u; \frac{p+c u}{2c}+1, \ldots, \frac{p+c u}{2c}+1; -e^{2cz}\right) + i^{u-v} 2^{v-m} \binom{u-v}{\frac{u-v}{2}} n! (1-(u-v) \bmod 2)$$

$$\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \Bigg(e^{(-i a (m-2k)+p+c u) z} \sum_{j=0}^{n} \frac{(-1)^j (-i a (m-2k)+p+c u)^{-j-1} z^{n-j}}{(n-j)!} \, {}_{j+2}F_{j+1}\left(\frac{-i a (m-2k)+p+c u}{2c}, \ldots, \frac{-i a (m-2k)+p+c u}{2c}, u; \frac{-i a (m-2k)+p+c u}{2c}+1, \ldots, \frac{-i a (m-2k)+p+c u}{2c}+1; -e^{2cz}\right) +$$

$$e^{(a\,i\,(m-2\,k)+p+c\,u)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(a\,i\,(m-2\,k)+p+c\,u)^{-j-1}\,z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}\Bigg(\frac{i\,a\,(m-2\,k)+p+c\,u}{2\,c},\,\ldots,$$

$$\frac{i\,a\,(m-2\,k)+p+c\,u}{2\,c},\,u;\,\frac{i\,a\,(m-2\,k)+p+c\,u}{2\,c}+1,\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,u}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)\Bigg)+$$

$$2^{v-m}\,e^{c\,u\,z}\binom{m}{\frac{m}{2}}n!\,(1-m\bmod 2)\sum_{k=0}^{\left\lfloor\frac{1}{2}(u-v-1)\right\rfloor}(-1)^k\binom{u-v}{k}\Bigg(e^{(p+c\,(-2\,k+u-v))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(p+c\,(-2\,k+2\,u-v))^{-j-1}\,z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{p+c\,(-2\,k+2\,u-v)}{2\,c},\,\ldots,\,\frac{p+c\,(-2\,k+2\,u-v)}{2\,c},\,u;\,\frac{p+c\,(-2\,k+2\,u-v)}{2\,c}+1,\,\ldots,$$

$$\frac{p+c\,(-2\,k+2\,u-v)}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+(-1)^{u-v}\,e^{(p-c\,(-2\,k+u-v))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(p+c\,(2\,k+v))^{-j-1}\,z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}$$

$$\Bigg(\frac{p+c\,(2\,k+v)}{2\,c},\,\ldots,\,\frac{p+c\,(2\,k+v)}{2\,c},\,u;\,\frac{p+c\,(2\,k+v)}{2\,c}+1,\,\ldots,\,\frac{p+c\,(2\,k+v)}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)\Bigg)+e^{c\,u\,z}\,2^{v-m}\,n!$$

$$\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\sum_{i=0}^{\left\lfloor\frac{1}{2}(u-v-1)\right\rfloor}(-1)^i\binom{u-v}{i}\Bigg(e^{(-i\,a\,(m-2\,k)+p+c\,(-2\,i+u-v))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(-i\,a\,(m-2\,k)+p+c\,(-2\,i+2\,u-v))^{-j-1}\,z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{-i\,a\,(m-2\,k)+p+c\,(-2\,i+2\,u-v)}{2\,c},\,\ldots,\,\frac{-i\,a\,(m-2\,k)+p+c\,(-2\,i+2\,u-v)}{2\,c},\,u;$$

$$\frac{-i\,a\,(m-2\,k)+p+c\,(-2\,i+2\,u-v)}{2\,c}+1,\,\ldots,\,\frac{-i\,a\,(m-2\,k)+p+c\,(-2\,i+2\,u-v)}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+$$

$$(-1)^{u-v}\,e^{(-i\,a\,(m-2\,k)+p-c\,(-2\,i+u-v))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(-i\,a\,(m-2\,k)+p+c\,(2\,i+v))^{-j-1}\,z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{-i\,a\,(m-2\,k)+p+c\,(2\,i+v)}{2\,c},\,\ldots,\,\frac{-i\,a\,(m-2\,k)+p+c\,(2\,i+v)}{2\,c},\,u;$$

$$\frac{-i\,a\,(m-2\,k)+p+c\,(2\,i+v)}{2\,c}+1,\,\ldots,\,\frac{-i\,a\,(m-2\,k)+p+c\,(2\,i+v)}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)\Bigg)+2^{v-m}\,e^{c\,u\,z}\,n!$$

$$\sum_{k=0}^{\left\lfloor\frac{m-1}{2}\right\rfloor}\binom{m}{k}\sum_{i=0}^{\left\lfloor\frac{1}{2}(u-v-1)\right\rfloor}(-1)^i\binom{u-v}{i}\Bigg(e^{(a\,i\,(m-2\,k)+p+c\,(-2\,i+u-v))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(a\,i\,(m-2\,k)+p+c\,(-2\,i+2\,u-v))^{-j-1}\,z^{n-j}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{i\,a\,(m-2\,k)+p+c\,(-2\,i+2\,u-v)}{2\,c},\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(-2\,i+2\,u-v)}{2\,c},\,u;$$

$$\frac{i\,a\,(m-2\,k)+p+c\,(-2\,i+2\,u-v)}{2\,c}+1,\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(-2\,i+2\,u-v)}{2\,c}+1;\,-e^{2\,c\,z}\Bigg)+$$

$$(-1)^{u-v}\,e^{(a\,i\,(m-2\,k)+p-c\,(-2\,i+u-v))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,(a\,i\,(m-2\,k)+p+c\,(2\,i+v))^{-j-1}\,z^{n-j}}{(n-j)!}\;{}_{j+2}F_{j+1}$$

$$\Bigg(\frac{i\,a\,(m-2\,k)+p+c\,(2\,i+v)}{2\,c},\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(2\,i+v)}{2\,c},\,u;\,\frac{i\,a\,(m-2\,k)+p+c\,(2\,i+v)}{2\,c}+$$

$$i\,a\,(m-2\,k)+p+c\,(2\,i+v)\qquad\Big)\Big)$$

Involving sin, coth, exp and power

Involving $z^n e^{pz} \sin(az) \coth(cz) \operatorname{csch}^\nu(cz)$

01.23.21.0589.01

$$\int z^n e^{pz} \sin(az)\coth(cz)\operatorname{csch}^\nu(cz)\,dz = \frac{1}{2} i e^{cz}\left(1-e^{2cz}\right)^\nu \operatorname{csch}^\nu(cz)\, n!\left(-e^{(-c-ia+p)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(-ia+p+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{-ia+p+c\nu}{2c},\ldots,\frac{-ia+p+c\nu}{2c},\nu+1;\frac{-ia+p+c\nu}{2c}+1,\ldots,\frac{-ia+p+c\nu}{2c}+1;e^{2cz}\right)+e^{(-c+ia+p)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(ia+p+c\nu)^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{ia+p+c\nu}{2c},\ldots,\frac{ia+p+c\nu}{2c},\nu+1;\frac{ia+p+c\nu}{2c}+1,\ldots,\frac{ia+p+c\nu}{2c}+1;e^{2cz}\right)-e^{(c-ia+p)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(-ia+p+c(\nu+2))^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{-ia+p+c(\nu+2)}{2c},\ldots,\frac{-ia+p+c(\nu+2)}{2c},\nu+1;\frac{-ia+p+c(\nu+2)}{2c}+1,\ldots,\frac{-ia+p+c(\nu+2)}{2c}+1;e^{2cz}\right)+e^{(c+ia+p)z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(ia+p+c(\nu+2))^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{ia+p+c(\nu+2)}{2c},\ldots,\frac{ia+p+c(\nu+2)}{2c},\nu+1;\frac{ia+p+c(\nu+2)}{2c}+1,\ldots,\frac{ia+p+c(\nu+2)}{2c}+1;e^{2cz}\right)\right)\ /;\ n\in\mathbb{N}$$

Involving powers of sin, powers of coth, exp and power

Involving $z^n e^{pz} \sin^m(az) \coth^u(cz) \operatorname{csch}^\nu(cz)$

01.23.21.0590.01

$$\int z^n e^{pz}\sin^m(az)\coth^u(cz)\operatorname{csch}^\nu(cz)\,dz = 2^{-m-u}\left(1-e^{2cz}\right)^{u+\nu}\binom{m}{\frac{m}{2}} n!\,(1-m \bmod 2)\left(e^{pz}\binom{u}{\frac{u}{2}}(1-u \bmod 2)\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p+c(u+\nu))^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{p+c(u+\nu)}{2c},\ldots,\frac{p+c(u+\nu)}{2c},u+\nu;\frac{p+c(u+\nu)}{2c}+1,\ldots,\frac{p+c(u+\nu)}{2c}+1;e^{2cz}\right)+\sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(e^{(p-c(u-2s))z}\sum_{j=0}^{n}\frac{(-1)^j z^{n-j}(p+c(2s+\nu))^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{p+c(2s+\nu)}{2c},\ldots,\frac{p+c(2s+\nu)}{2c},u+\nu;\frac{p+c(2s+\nu)}{2c}+1,\ldots,\frac{p+c(2s+\nu)}{2c}+1;e^{2cz}\right)+e^{(p+c(u-2s))z}\right.\right.$$

$$\sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p + c(-2s + 2u + v))^{-j-1}}{(n-j)!} {}_{j+2}F_{j+1}\Bigg(\frac{p + c(-2s + 2u + v)}{2c}, \ldots, \frac{p + c(-2s + 2u + v)}{2c}, u + v;$$

$$\frac{p + c(-2s + 2u + v)}{2c} + 1, \ldots, \frac{p + c(-2s + 2u + v)}{2c} + 1; e^{2cz}\Bigg)\Bigg)\Bigg) \operatorname{csch}^{u+v}(cz) + 2^{-m-u} \left(1 - e^{2cz}\right)^{u+v}$$

$$n! \Bigg(\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} (-1)^k \binom{m}{k} \Bigg(e^{\frac{i m \pi}{2}} \Bigg(e^{(p - i a(m-2k))z} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a(m-2k) + p + c(u+v))^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{-i a(m-2k) + p + c(u+v)}{2c}, \ldots, \frac{-i a(m-2k) + p + c(u+v)}{2c}, u + v;$$

$$\frac{-i a(m-2k) + p + c(u+v)}{2c} + 1, \ldots, \frac{-i a(m-2k) + p + c(u+v)}{2c} + 1; e^{2cz}\Bigg) +$$

$$\sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \Bigg(e^{(-i a(m-2k) + p - c(u-2s))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a(m-2k) + p + c(2s+v))^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{-i a(m-2k) + p + c(2s+v)}{2c}, \ldots, \frac{-i a(m-2k) + p + c(2s+v)}{2c}, u + v;$$

$$\frac{-i a(m-2k) + p + c(2s+v)}{2c} + 1, \ldots, \frac{-i a(m-2k) + p + c(2s+v)}{2c} + 1; e^{2cz}\Bigg) +$$

$$e^{(-i a(m-2k) + p + c(u-2s))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a(m-2k) + p + c(-2s + 2u + v))^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{-i a(m-2k) + p + c(-2s + 2u + v)}{2c}, \ldots, \frac{-i a(m-2k) + p + c(-2s + 2u + v)}{2c},$$

$$u + v; \frac{-i a(m-2k) + p + c(-2s + 2u + v)}{2c} + 1, \ldots,$$

$$\frac{-i a(m-2k) + p + c(-2s + 2u + v)}{2c} + 1; e^{2cz}\Bigg)\Bigg)\Bigg) +$$

$$e^{-\frac{1}{2} i m \pi} \Bigg(e^{(a i (m-2k) + p)z} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (a i (m-2k) + p + c(u+v))^{-j-1}}{(n-j)!}$$

$${}_{j+2}F_{j+1}\Bigg(\frac{i a(m-2k) + p + c(u+v)}{2c}, \ldots, \frac{i a(m-2k) + p + c(u+v)}{2c}, u + v;$$

$$\frac{i a(m-2k) + p + c(u+v)}{2c} + 1, \ldots, \frac{i a(m-2k) + p + c(u+v)}{2c} + 1; e^{2cz}\Bigg) +$$

$$\sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \Bigg(e^{(a i (m-2k) + p - c(u-2s))z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (a i (m-2k) + p + c(2s+v))^{-j-1}}{(n-j)!}$$

$$
{}_{j+2}F_{j+1}\left(\frac{i\,a\,(m-2\,k)+p+c\,(2\,s+\nu)}{2\,c},\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(2\,s+\nu)}{2\,c},\,u+\nu;\right.
\left.\frac{i\,a\,(m-2\,k)+p+c\,(2\,s+\nu)}{2\,c}+1,\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(2\,s+\nu)}{2\,c}+1;\,e^{2\,c\,z}\right)+
e^{(a\,i\,(m-2\,k)+p+c\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(a\,i\,(m-2\,k)+p+c\,(-2\,s+2\,u+\nu))^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}
\left(\frac{i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+\nu)}{2\,c},\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+\nu)}{2\,c},\,u+\nu;\right.
\frac{i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+\nu)}{2\,c}+1,\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+\nu)}{2\,c}+1;
\left.\left.\left.\left.e^{2\,c\,z}\right)\right)\right)\right)\operatorname{csch}^{u+\nu}(c\,z)\;/;\;n\in\mathbb{N}\bigwedge m\in\mathbb{N}^+\bigwedge u\in\mathbb{N}^+
$$

Involving cos, coth, exp and power

Involving $z^n\,e^{p\,z}\cos(a\,z)\coth(c\,z)\operatorname{csch}^{\nu}(c\,z)$

01.23.21.0591.01

$$
\int z^n\,e^{p\,z}\cos(a\,z)\coth(c\,z)\operatorname{csch}^{\nu}(c\,z)\,dz = -\frac{1}{2}\,e^{c\,z}\left(1-e^{2\,c\,z}\right)^{\nu}\operatorname{csch}^{\nu}(c\,z)\,n!\left(e^{(-c-i\,a+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(-i\,a+p+c\,\nu)^{-j-1}}{(n-j)!}\right.
{}_{j+2}F_{j+1}\left(\frac{-i\,a+p+c\,\nu}{2\,c},\,\ldots,\,\frac{-i\,a+p+c\,\nu}{2\,c},\,\nu+1;\,\frac{-i\,a+p+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{-i\,a+p+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\right)+
e^{(c+i\,a+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(i\,a+p+c\,(\nu+2))^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{i\,a+p+c\,(2+\nu)}{2\,c},\,\ldots,\,\frac{i\,a+p+c\,(2+\nu)}{2\,c},\,\nu+1;\right.
\left.\frac{i\,a+p+c\,(2+\nu)}{2\,c}+1,\,\ldots,\,\frac{i\,a+p+c\,(2+\nu)}{2\,c}+1;\,e^{2\,c\,z}\right)+e^{(-c+i\,a+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(i\,a+p+c\,\nu)^{-j-1}}{(n-j)!}
{}_{j+2}F_{j+1}\left(\frac{i\,a+p+c\,\nu}{2\,c},\,\ldots,\,\frac{i\,a+p+c\,\nu}{2\,c},\,\nu+1;\,\frac{i\,a+p+c\,\nu}{2\,c}+1,\,\ldots,\,\frac{i\,a+p+c\,\nu}{2\,c}+1;\,e^{2\,c\,z}\right)+
e^{(c-i\,a+p)\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(-i\,a+p+c\,(\nu+2))^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\left(\frac{-i\,a+p+c\,(2+\nu)}{2\,c},\,\ldots,\,\frac{-i\,a+p+c\,(2+\nu)}{2\,c},\right.
\left.\left.\nu+1;\,\frac{-i\,a+p+c\,(2+\nu)}{2\,c}+1,\,\ldots,\,\frac{-i\,a+p+c\,(2+\nu)}{2\,c}+1;\,e^{2\,c\,z}\right)\right)\;/;\;n\in\mathbb{N}
$$

Involving powers of cos, powers of coth, exp and power

Involving $z^n\,e^{p\,z}\cos^m(a\,z)\coth^u(c\,z)\operatorname{csch}^{\nu}(c\,z)$

01.23.21.0592.01

$$\int z^n e^{p z} \cos^m(a z) \coth^u(c z) \operatorname{csch}^\nu(c z) \, dz = 2^{-m-u} \left(1 - e^{2 c z}\right)^{u+\nu} \binom{m}{\frac{m}{2}} n! \, (1 - m \bmod 2) \left(e^{p z} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p + c (u + \nu))^{-j-1}}{(n-j)!} \right.$$

$$_{j+2}F_{j+1}\left(\frac{p + c (u + \nu)}{2 c}, \ldots, \frac{p + c (u + \nu)}{2 c}, u + \nu; \frac{p + c (u + \nu)}{2 c} + 1, \ldots, \frac{p + c (u + \nu)}{2 c} + 1; e^{2 c z}\right) +$$

$$\sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(e^{(p - c (u - 2 s)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p + c (2 s + \nu))^{-j-1}}{(n-j)!} \, _{j+2}F_{j+1}\left(\frac{p + c (2 s + \nu)}{2 c}, \ldots, \frac{p + c (2 s + \nu)}{2 c}, \right.\right.$$

$$\left. u + \nu; \frac{p + c (2 s + \nu)}{2 c} + 1, \ldots, \frac{p + c (2 s + \nu)}{2 c} + 1; e^{2 c z}\right) + e^{(p + c (u - 2 s)) z}$$

$$\sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (p + c (-2 s + 2 u + \nu))^{-j-1}}{(n-j)!} \, _{j+2}F_{j+1}\left(\frac{p + c (-2 s + 2 u + \nu)}{2 c}, \ldots, \frac{p + c (-2 s + 2 u + \nu)}{2 c}, \right.$$

$$\left.\left.\left. u + \nu; \frac{p + c (-2 s + 2 u + \nu)}{2 c} + 1, \ldots, \frac{p + c (-2 s + 2 u + \nu)}{2 c} + 1; e^{2 c z}\right)\right)\right) \operatorname{csch}^{u+\nu}(c z) +$$

$$2^{-m-u} \left(1 - e^{2 c z}\right)^{u+\nu} n! \left(\sum_{k=0}^{\left\lfloor \frac{m-1}{2} \right\rfloor} \binom{m}{k} \left(e^{(p - i a (m - 2 k)) z} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a (m - 2 k) + p + c (u + \nu))^{-j-1}}{(n-j)!} \right.\right.$$

$$_{j+2}F_{j+1}\left(\frac{-i a (m - 2 k) + p + c (u + \nu)}{2 c}, \ldots, \frac{-i a (m - 2 k) + p + c (u + \nu)}{2 c}, u + \nu; \right.$$

$$\left. \frac{-i a (m - 2 k) + p + c (u + \nu)}{2 c} + 1, \ldots, \frac{-i a (m - 2 k) + p + c (u + \nu)}{2 c} + 1; e^{2 c z}\right) +$$

$$e^{(a i (m - 2 k) + p) z} \binom{u}{\frac{u}{2}} (1 - u \bmod 2) \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (a i (m - 2 k) + p + c (u + \nu))^{-j-1}}{(n-j)!}$$

$$_{j+2}F_{j+1}\left(\frac{i a (m - 2 k) + p + c (u + \nu)}{2 c}, \ldots, \frac{i a (m - 2 k) + p + c (u + \nu)}{2 c}, u + \nu; \right.$$

$$\left. \frac{i a (m - 2 k) + p + c (u + \nu)}{2 c} + 1, \ldots, \frac{i a (m - 2 k) + p + c (u + \nu)}{2 c} + 1; e^{2 c z}\right) +$$

$$\sum_{s=0}^{\left\lfloor \frac{u-1}{2} \right\rfloor} \binom{u}{s} \left(e^{(-i a (m - 2 k) + p - c (u - 2 s)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a (m - 2 k) + p + c (2 s + \nu))^{-j-1}}{(n-j)!} \right.$$

$$_{j+2}F_{j+1}\left(\frac{-i a (m - 2 k) + p + c (2 s + \nu)}{2 c}, \ldots, \frac{-i a (m - 2 k) + p + c (2 s + \nu)}{2 c}, u + \nu; \right.$$

$$\left. \frac{-i a (m - 2 k) + p + c (2 s + \nu)}{2 c} + 1, \ldots, \frac{-i a (m - 2 k) + p + c (2 s + \nu)}{2 c} + 1; e^{2 c z}\right) +$$

$$e^{(-i a (m - 2 k) + p + c (u - 2 s)) z} \sum_{j=0}^{n} \frac{(-1)^j z^{n-j} (-i a (m - 2 k) + p + c (-2 s + 2 u + \nu))^{-j-1}}{(n-j)!}$$

$$ {}_{j+2}F_{j+1}\left(\frac{-i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+v)}{2\,c},\,\ldots,\,\frac{-i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+v)}{2\,c},\right. $$
$$ u+v;\,\frac{-i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+v)}{2\,c}+1,\,\ldots, $$
$$ \left.\left.\frac{-i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+v)}{2\,c}+1;\,e^{2\,c\,z}\right)\right)+ $$

$$ \sum_{s=0}^{\left\lfloor\frac{u-1}{2}\right\rfloor}\binom{u}{s}\left(e^{(a\,i\,(m-2\,k)+p-c\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(a\,i\,(m-2\,k)+p+c\,(2\,s+v))^{-j-1}}{(n-j)!}\,{}_{j+2}F_{j+1}\right. $$
$$ \left(\frac{i\,a\,(m-2\,k)+p+c\,(2\,s+v)}{2\,c},\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(2\,s+v)}{2\,c},\,u+v;\right. $$
$$ \left.\frac{i\,a\,(m-2\,k)+p+c\,(2\,s+v)}{2\,c}+1,\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(2\,s+v)}{2\,c}+1;\,e^{2\,c\,z}\right)+ $$
$$ e^{(a\,i\,(m-2\,k)+p+c\,(u-2\,s))\,z}\sum_{j=0}^{n}\frac{(-1)^j\,z^{n-j}\,(a\,i\,(m-2\,k)+p+c\,(-2\,s+2\,u+v))^{-j-1}}{(n-j)!} $$
$$ {}_{j+2}F_{j+1}\left(\frac{i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+v)}{2\,c},\,\ldots,\,\frac{i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+v)}{2\,c},\right. $$
$$ u+v;\,\frac{i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+v)}{2\,c}+1,\,\ldots, $$
$$ \left.\left.\left.\frac{i\,a\,(m-2\,k)+p+c\,(-2\,s+2\,u+v)}{2\,c}+1;\,e^{2\,c\,z}\right)\right)\right)\operatorname{csch}^{u+v}(c\,z)\;/;\;n\in\mathbb{N}\land m\in\mathbb{N}^+\land u\in\mathbb{N}^+ $$

Definite integration

For the direct function itself

01.23.21.0013.01

$$ \int_0^\infty t\operatorname{csch}(t)\,dt=\frac{\pi^2}{4} $$

01.23.21.0014.01

$$ \int_0^\infty t^2\operatorname{csch}(t)\,dt=\frac{7\,\zeta(3)}{2} $$

01.23.21.0015.01

$$ \int_0^\infty t^3\operatorname{csch}(t)\,dt=\frac{\pi^4}{8} $$

Involving the direct function

01.23.21.0016.01

$$ \int_0^\infty t\,e^{-t}\operatorname{csch}(t)\,dt=\frac{\pi^2}{12} $$

01.23.21.0017.01

$$\int_0^\infty t^2 e^{-t} \operatorname{csch}(t)\, dt = \frac{\zeta(3)}{2}$$

01.23.21.0018.01

$$\int_0^\infty t^3 e^{-t} \operatorname{csch}(t)\, dt = \frac{\pi^4}{120}$$

Summation

Finite summation

01.23.23.0002.01

$$\sum_{k=0}^{n-1} \operatorname{csch}^2\left(\frac{i \pi k}{n} + z\right) = n^2 \operatorname{csch}^2(n z) /; n \in \mathbb{N}^+$$

01.23.23.0003.01

$$\sum_{k=0}^{n} \operatorname{csch}\left(\frac{z}{2^k}\right) = \coth\left(\frac{z}{2^{n+1}}\right) - \coth(z) /; n \in \mathbb{N}$$

Infinite summation

01.23.23.0001.01

$$\sum_{k=1}^{\infty} \frac{\operatorname{csch}(k z)}{k} = \frac{z}{12} - \frac{1}{6} \log\left(\frac{1-\kappa^2}{\kappa}\right) - \frac{\log(2)}{3} /; \kappa = \sqrt{q^{-1}(e^{-z})}$$

Products

Finite products

01.23.24.0001.01

$$\prod_{k=0}^{n-1} \operatorname{csch}\left(\frac{i \pi k}{n} + z\right) = 2^{n-1} i^{1-n} \operatorname{csch}(n z) /; n \in \mathbb{N}^+$$

Representations through more general functions

Through hypergeometric functions

01.23.26.0029.01

$$\operatorname{csch}(z) = \frac{2}{z} \, {}_3F_2\left(1, -\frac{i z}{\pi}, \frac{i z}{\pi}; 1 - \frac{i z}{\pi}, \frac{i z}{\pi} + 1; -1\right) - \frac{1}{z}$$

Brychkov Yu.A. (2005)

01.23.26.0001.01

$$\operatorname{csch}(z) = \frac{1}{z \, {}_0F_1\left(; \frac{3}{2}; \frac{z^2}{4}\right)}$$

Through Meijer *G*

Classical cases for the direct function itself

01.23.26.0002.01

$$\operatorname{csch}(z) = \frac{\sqrt{-z^2}}{z\sqrt{\pi}\; G_{0,2}^{1,0}\!\left(-\frac{z^2}{4} \,\middle|\, \frac{1}{2}, 0\right)}$$

Generalized cases for the direct function itself

01.23.26.0003.01

$$\operatorname{csch}(z) = \frac{i}{\sqrt{\pi}\; G_{0,2}^{1,0}\!\left(\frac{i z}{2}, \frac{1}{2} \,\middle|\, \frac{1}{2}, 0\right)}$$

Through other functions

Involving Bessel functions

01.23.26.0004.01

$$\operatorname{csch}(z) = \frac{i}{\sqrt{\frac{\pi i z}{2}}\; J_{\frac{1}{2}}(i z)}$$

01.23.26.0005.01

$$\operatorname{csch}(z) = \frac{1}{\sqrt{\frac{\pi z}{2}}\; I_{\frac{1}{2}}(z)}$$

01.23.26.0006.01

$$\operatorname{csch}(z) = \frac{i}{\sqrt{\frac{\pi i z}{2}}\; Y_{-\frac{1}{2}}(i z)}$$

Involving Jacobi functions

01.23.26.0007.01

$$\operatorname{csch}(z) = \frac{i}{\operatorname{cd}\left(\frac{\pi}{2} - i z \,\middle|\, 0\right)}$$

01.23.26.0008.01

$$\operatorname{csch}(z) = \frac{i}{\operatorname{cn}\left(\frac{\pi}{2} - i z \,\middle|\, 0\right)}$$

01.23.26.0009.01

$$\operatorname{csch}(z) = -i\operatorname{cn}\left(\frac{\pi i}{2} - z \,\middle|\, 1\right)$$

01.23.26.0010.01

$$\operatorname{csch}(z) = \operatorname{cs}(z \mid 1)$$

01.23.26.0011.01

$$\operatorname{csch}(z) = i\operatorname{dc}\left(\frac{\pi}{2} - i z \,\middle|\, 0\right)$$

01.23.26.0012.01

$$\operatorname{csch}(z) == -i\,\operatorname{dn}\left(\frac{\pi i}{2} - z \,\middle|\, 1\right)$$

01.23.26.0013.01

$$\operatorname{csch}(z) == i\,\operatorname{ds}(i\,z \mid 0)$$

01.23.26.0014.01

$$\operatorname{csch}(z) == \operatorname{ds}(z \mid 1)$$

01.23.26.0015.01

$$\operatorname{csch}(z) == i\,\operatorname{nc}\left(\frac{\pi}{2} - i\,z \,\middle|\, 0\right)$$

01.23.26.0016.01

$$\operatorname{csch}(z) == -\frac{i}{\operatorname{nc}\left(\frac{\pi i}{2} - z \,\middle|\, 1\right)}$$

01.23.26.0017.01

$$\operatorname{csch}(z) == -\frac{i}{\operatorname{nd}\left(\frac{\pi i}{2} - z \,\middle|\, 1\right)}$$

01.23.26.0018.01

$$\operatorname{csch}(z) == i\,\operatorname{ns}(i\,z \mid 0)$$

01.23.26.0019.01

$$\operatorname{csch}(z) == \frac{1}{\operatorname{sc}(z \mid 1)}$$

01.23.26.0020.01

$$\operatorname{csch}(z) == \frac{1}{\operatorname{sd}(z \mid 1)}$$

01.23.26.0021.01

$$\operatorname{csch}(z) == \frac{i}{\operatorname{sd}(i\,z \mid 0)}$$

01.23.26.0022.01

$$\operatorname{csch}(z) == \frac{i}{\operatorname{sn}(i\,z \mid 0)}$$

Involving Mathieu functions

01.23.26.0023.01

$$\operatorname{csch}\left(\sqrt{a}\;z\right) == \frac{i}{\operatorname{Se}(a,\,0,\,i\,z)}$$

01.23.26.0024.01

$$\operatorname{csch}\left(\sqrt{a}\;z\right) == -\frac{i\,\sqrt{a}}{\operatorname{Ce}_z(a,\,0,\,i\,z)}$$

Involving some hypergeometric-type functions

01.23.26.0025.01

$$\operatorname{csch}(\pi\,z) == \frac{i\,(\Gamma(1 - i\,z)\,\Gamma(i\,z))}{\pi}$$

01.23.26.0026.01

$$\operatorname{csch}(z) = \frac{i \sqrt{\frac{2}{\pi}}}{\sqrt{i z}\, \boldsymbol{H}_{-\frac{1}{2}}(i z)}$$

01.23.26.0027.01

$$\operatorname{csch}(z) = \sqrt{\frac{2}{\pi}}\, \frac{1}{\sqrt{z}\, \boldsymbol{L}_{-\frac{1}{2}}(z)}$$

01.23.26.0028.01

$$\operatorname{csch}(n z) = \frac{\operatorname{csch}(z)}{U_{n-1}(\cosh(z))}$$

Representations through equivalent functions

With inverse function

01.23.27.0001.01

$$\operatorname{csch}\left(\operatorname{csch}^{-1}(z)\right) = z$$

01.23.27.0002.02

$$\operatorname{csch}^{-1}(\operatorname{csch}(z)) = z \;/;\; -\frac{\pi}{2} < \operatorname{Im}(z) < \frac{\pi}{2} \bigvee \left(\operatorname{Im}(z) = -\frac{\pi}{2} \bigwedge \operatorname{Re}(z) \leq 0\right) \bigvee \left(\operatorname{Im}(z) = \frac{\pi}{2} \bigwedge \operatorname{Re}(z) \geq 0\right)$$

01.23.27.0070.01

$$\operatorname{csch}^{-1}(\operatorname{csch}(z)) = -\pi i - z \;/;\; -\frac{3\pi}{2} < \operatorname{Im}(z) < -\frac{\pi}{2} \bigvee \operatorname{Im}(z) = -\frac{3\pi}{2} \bigwedge \operatorname{Re}(z) \leq 0 \bigvee \operatorname{Im}(z) = -\frac{\pi}{2} \bigwedge \operatorname{Re}(z) \geq 0$$

01.23.27.0071.01

$$\operatorname{csch}^{-1}(\operatorname{csch}(z)) = \pi i - z \;/;\; \frac{\pi}{2} < \operatorname{Im}(z) < \frac{3\pi}{2} \bigvee \operatorname{Im}(z) = \frac{\pi}{2} \bigwedge \operatorname{Re}(z) \leq 0 \bigvee \operatorname{Im}(z) = \frac{3\pi}{2} \bigwedge \operatorname{Re}(z) \geq 0$$

01.23.27.0072.01

$$\operatorname{csch}^{-1}(\operatorname{csch}(z)) = (-1)^k (z - \pi i k) \;/;$$
$$\left(k\pi - \frac{\pi}{2} < \operatorname{Im}(z) < \pi k + \frac{\pi}{2} \bigvee \operatorname{Im}(z) = k\pi - \frac{\pi}{2} \bigwedge \operatorname{Re}(z) \leq 0 \bigvee \operatorname{Im}(z) = \pi k + \frac{\pi}{2} \bigwedge \operatorname{Re}(z) \geq 0\right) \bigwedge k \in \mathbb{Z}$$

01.23.27.0003.01

$$\operatorname{csch}^{-1}(\operatorname{csch}(z)) =$$
$$(-1)^{\left\lfloor -\frac{\operatorname{Im}(z)}{\pi} - \frac{1}{2} \right\rfloor} \left(\left(1 + (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} - \frac{1}{2} \right\rfloor + \left\lfloor \frac{1}{2} - \frac{\operatorname{Im}(z)}{\pi} \right\rfloor}\right) \theta(-\operatorname{Re}(z)) - 1\right) \left(z + i\pi \left\lfloor \frac{1}{2} - \frac{\operatorname{Im}(z)}{\pi} \right\rfloor - \frac{\pi i}{2} \left(1 + (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} - \frac{1}{2} \right\rfloor + \left\lfloor \frac{1}{2} - \frac{\operatorname{Im}(z)}{\pi} \right\rfloor}\right) \theta(-\operatorname{Re}(z))\right)$$

01.23.27.0073.01

$$\operatorname{csch}^{-1}(\operatorname{csch}(z)) = \begin{cases} (-1)^{\left\lfloor \frac{2 \operatorname{Im}(z) + \pi}{2\pi} \right\rfloor} \left(\pi i \left\lfloor \frac{2 \operatorname{Im}(z) - \pi}{2\pi} \right\rfloor - z\right) & \frac{2 \operatorname{Im}(z) + \pi}{2\pi} \in \mathbb{Z} \bigwedge \operatorname{Re}(z) \geq 0 \\ (-1)^{\left\lfloor \frac{2 \operatorname{Im}(z) + \pi}{2\pi} \right\rfloor} \left(z - \pi i \left\lfloor \frac{2 \operatorname{Im}(z) + \pi}{2\pi} \right\rfloor\right) & \text{True} \end{cases}$$

With related functions

Involving exp

01.23.27.0004.01

$$\operatorname{csch}(z) = \frac{2}{e^z - e^{-z}}$$

01.23.27.0005.01

$$\operatorname{csch}(z) = \frac{2\, e^z}{e^{2z} - 1}$$

Involving sin

01.23.27.0006.01

$$\operatorname{csch}(z) = \frac{i}{\sin(i\, z)}$$

01.23.27.0007.01

$$\operatorname{csch}(i\, z) = -\frac{i}{\sin(z)}$$

Involving cos

01.23.27.0008.01

$$\operatorname{csch}(z) = \frac{i}{\cos\left(\frac{\pi}{2} - i\, z\right)}$$

01.23.27.0009.01

$$\operatorname{csch}(z) = -\frac{i}{\cos\left(i\, z + \frac{\pi}{2}\right)}$$

01.23.27.0010.01

$$\operatorname{csch}(z) = \frac{\sqrt{-z^2}}{z} \frac{\sqrt{2}}{\sqrt{1 - \cos(2\, i\, z)}} \;/;\; |\operatorname{Im}(z)| < \pi$$

01.23.27.0011.01

$$\operatorname{csch}(z) = -\frac{i\sqrt{2}}{\sqrt{1 - \cos(2\, i\, z)}} \;/;\; 0 < \operatorname{Im}(z) < \pi$$

01.23.27.0012.01

$$\operatorname{csch}(z) = \frac{i\sqrt{2}}{\sqrt{1 - \cos(2\, i\, z)}} (-1)^{\left\lfloor -\frac{\operatorname{Im}(z)}{\pi} \right\rfloor} \left(1 - \left(1 + (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} \right\rfloor + \left\lfloor -\frac{\operatorname{Im}(z)}{\pi} \right\rfloor}\right) \theta(-\operatorname{Re}(z))\right)$$

01.23.27.0013.01

$$\operatorname{csch}(z) = \frac{\sqrt{-z^2}}{z} \frac{1}{\sqrt{1 - \cos^2(i\, z)}} \;/;\; |\operatorname{Im}(z)| < \pi$$

01.23.27.0014.01

$$\operatorname{csch}(z) = \frac{i}{\sqrt{1 - \cos^2(i\, z)}} (-1)^{\left\lfloor -\frac{\operatorname{Im}(z)}{\pi} \right\rfloor} \left(1 - \left(1 + (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} \right\rfloor + \left\lfloor -\frac{\operatorname{Im}(z)}{\pi} \right\rfloor}\right) \theta(-\operatorname{Re}(z))\right)$$

01.23.27.0015.01

$$\operatorname{csch}(z) = \frac{\sqrt{z^2}}{z} \frac{1}{\sqrt{\cos^2(i\, z) - 1}} \;/;\; |\operatorname{Im}(z)| < \frac{\pi}{2}$$

01.23.27.0016.01

$$\operatorname{csch}(z) == \frac{\sqrt{z^2}}{z\sqrt{\cos^2(i\,z)-1}}\,(-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi}+\frac{1}{2}\right\rfloor}\left(1-\left(1+(-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi}+\frac{1}{2}\right\rfloor+\left\lfloor -\frac{\operatorname{Im}(z)}{\pi}-\frac{1}{2}\right\rfloor}\right)\theta(\operatorname{Re}(z))\right) /;\, -\frac{2\,z-\pi\,i}{2\,\pi\,i}\notin \mathbb{N}^+$$

01.23.27.0017.01

$$\operatorname{csch}^2(z) == \frac{2}{\cos(2\,i\,z)-1}$$

01.23.27.0018.01

$$\operatorname{csch}^2(z) == \frac{1}{\cos^2(i\,z)-1}$$

Involving tan

01.23.27.0019.01

$$\operatorname{csch}(z) == \frac{i\left(\tan^2\left(\frac{z\,i}{2}\right)+1\right)}{2\tan\left(\frac{z\,i}{2}\right)}$$

01.23.27.0020.01

$$\operatorname{csch}(z) == \frac{i\sqrt{\tan^2(i\,z)+1}}{\tan(i\,z)} /;\, |\operatorname{Im}(z)| < \frac{\pi}{2}$$

01.23.27.0021.01

$$\operatorname{csch}(z) == \frac{i\sqrt{1+\tan^2(i\,z)}}{\tan(i\,z)}\,(-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi}+\frac{1}{2}\right\rfloor}\left(1-\left(1+(-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi}+\frac{1}{2}\right\rfloor+\left\lfloor -\frac{\operatorname{Im}(z)}{\pi}-\frac{1}{2}\right\rfloor}\right)\theta(-\operatorname{Re}(z))\right)$$

01.23.27.0022.01

$$\operatorname{csch}^2(z) == -\frac{\tan^2(i\,z)+1}{\tan^2(i\,z)}$$

Involving cot

01.23.27.0023.01

$$\operatorname{csch}(z) == \frac{i\left(\cot^2\left(\frac{i\,z}{2}\right)+1\right)}{2\cot\left(\frac{i\,z}{2}\right)}$$

01.23.27.0024.01

$$\operatorname{csch}(z) == z\sqrt{\frac{1}{z^2}}\sqrt{-\cot^2(i\,z)-1} /;\, |\operatorname{Im}(z)| < \frac{\pi}{2} \bigwedge \operatorname{Re}(z)\neq 0$$

01.23.27.0025.01

$$\operatorname{csch}(z) == \frac{\sqrt{z^2}}{z}\sqrt{-\cot^2(i\,z)-1}\,(-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi}+\frac{1}{2}\right\rfloor}\left(1-\left(1+(-1)^{\left\lfloor \frac{1}{2}+\frac{\operatorname{Im}(z)}{\pi}\right\rfloor+\left\lfloor -\frac{\operatorname{Im}(z)}{\pi}-\frac{1}{2}\right\rfloor}\right)\theta(-\operatorname{Re}(z))\right) /;\, \operatorname{Re}(z)\neq 0$$

01.23.27.0026.01

$$\operatorname{csch}(z) == \frac{\sqrt{-z^2}}{z}\sqrt{1+\cot^2(i\,z)} /;\, 0 < |\operatorname{Im}(z)| < \pi$$

01.23.27.0027.01

$$\operatorname{csch}(z) == -i \sqrt{\cot^2(i\, z) + 1} \;/;\; 0 < \operatorname{Im}(z) < \pi$$

01.23.27.0028.01

$$\operatorname{csch}(z) == i \sqrt{1 + \cot^2(i\, z)}\; (-1)^{\left\lfloor -\frac{\operatorname{Im}(z)}{\pi} \right\rfloor} \left(1 - \left(1 + (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} \right\rfloor + \left\lfloor -\frac{\operatorname{Im}(z)}{\pi} \right\rfloor}\right) \theta(\operatorname{Re}(z))\right)$$

01.23.27.0029.01

$$\operatorname{csch}^2(z) == -\cot^2(i\, z) - 1$$

Involving csc

01.23.27.0030.01

$$\operatorname{csch}(z) == i \csc(i\, z)$$

01.23.27.0031.01

$$\operatorname{csch}(i\, z) == -i \csc(z)$$

Involving sec

01.23.27.0032.01

$$\operatorname{csch}(z) == i \sec\left(\frac{\pi}{2} - i\, z\right)$$

01.23.27.0033.01

$$\operatorname{csch}(z) == -i \sec\left(\frac{\pi}{2} + i\, z\right)$$

01.23.27.0034.01

$$\operatorname{csch}(z) == \frac{\sqrt{-z^2}}{z} \frac{\sec(i\, z)}{\sqrt{\sec^2(i\, z) - 1}} \;/;\; |\operatorname{Im}(z)| < \frac{\pi}{2}$$

01.23.27.0035.01

$$\operatorname{csch}(z) == z \sqrt{\frac{1}{z^2}} \frac{\sec(i\, z)}{\sqrt{1 - \sec^2(i\, z)}} \;/;\; \operatorname{Re}(z) \neq 0$$

01.23.27.0036.01

$$\operatorname{csch}^2(z) == \frac{\sec^2(i\, z)}{1 - \sec^2(i\, z)}$$

Involving sinh

01.23.27.0037.01

$$\operatorname{csch}(z) == \frac{1}{\sinh(z)}$$

Involving cosh

01.23.27.0038.01

$$\operatorname{csch}(z) == -\frac{i}{\cosh\left(\frac{\pi\, i}{2} - z\right)}$$

01.23.27.0039.01

$$\operatorname{csch}(z) = \frac{i}{\cosh\left(\frac{\pi i}{2} + z\right)}$$

01.23.27.0040.01

$$\operatorname{csch}(z) = -\frac{i\sqrt{2}}{\sqrt{1-\cosh(2z)}} \;/;\; 0 < \operatorname{Im}(z) < \pi$$

01.23.27.0041.01

$$\operatorname{csch}(z) = \frac{i\sqrt{2}}{\sqrt{1-\cosh(2z)}} (-1)^{\left\lfloor -\frac{\operatorname{Im}(z)}{\pi} \right\rfloor} \left(1 - \left(1 + (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} \right\rfloor + \left\lfloor -\frac{\operatorname{Im}(z)}{\pi} \right\rfloor}\right) \theta(-\operatorname{Re}(z))\right)$$

01.23.27.0042.01

$$\operatorname{csch}(z) = \frac{\sqrt{-z^2}}{z} \frac{1}{\sqrt{1-\cosh^2(z)}} \;/;\; |\operatorname{Im}(z)| < \pi$$

01.23.27.0043.01

$$\operatorname{csch}(z) = \frac{i}{\sqrt{1-\cosh^2(z)}} (-1)^{\left\lfloor -\frac{\operatorname{Im}(z)}{\pi} \right\rfloor} \left(1 - \left(1 + (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} \right\rfloor + \left\lfloor -\frac{\operatorname{Im}(z)}{\pi} \right\rfloor}\right) \theta(-\operatorname{Re}(z))\right)$$

01.23.27.0044.01

$$\operatorname{csch}(z) = \frac{\sqrt{z^2}}{z} \frac{1}{\sqrt{\cosh^2(z) - 1}} \;/;\; |\operatorname{Im}(z)| < \frac{\pi}{2}$$

01.23.27.0045.01

$$\operatorname{csch}(z) = \frac{\sqrt{z^2}\, (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} + \frac{1}{2} \right\rfloor}}{z\sqrt{\cosh^2(z) - 1}} \left(1 - \left(1 + (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} + \frac{1}{2} \right\rfloor + \left\lfloor -\frac{\operatorname{Im}(z)}{\pi} - \frac{1}{2} \right\rfloor}\right) \theta(\operatorname{Re}(z))\right) \;/;\; -\frac{2z - \pi i}{2\pi i} \notin \mathbb{N}^+$$

01.23.27.0046.01

$$\operatorname{csch}^2(z) = \frac{1}{\cosh^2(z) - 1}$$

Involving tanh

01.23.27.0047.01

$$\operatorname{csch}(z) = \frac{1 - \tanh^2\left(\frac{z}{2}\right)}{2\tanh\left(\frac{z}{2}\right)}$$

01.23.27.0048.01

$$\operatorname{csch}(z) = \frac{\sqrt{1-\tanh^2(z)}}{\tanh(z)} \;/;\; |\operatorname{Im}(z)| < \frac{\pi}{2}$$

01.23.27.0049.01

$$\operatorname{csch}(z) = \frac{\sqrt{1-\tanh^2(z)}}{\tanh(z)} (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} + \frac{1}{2} \right\rfloor} \left(1 - \left(1 + (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} + \frac{1}{2} \right\rfloor + \left\lfloor -\frac{\operatorname{Im}(z)}{\pi} - \frac{1}{2} \right\rfloor}\right) \theta(-\operatorname{Re}(z))\right)$$

01.23.27.0050.01

$$\operatorname{csch}^2(z) = \frac{1-\tanh^2(z)}{\tanh^2(z)}$$

Involving coth

01.23.27.0051.01

$$\operatorname{csch}(z) = \frac{\coth^2\left(\frac{z}{2}\right)-1}{2\coth\left(\frac{z}{2}\right)}$$

01.23.27.0052.01

$$\operatorname{csch}(z) = \sqrt{\coth^2(z)-1} \;/;\; |\operatorname{Im}(z)| < \frac{\pi}{2} \bigwedge \operatorname{Re}(z) > 0$$

01.23.27.0053.01

$$\operatorname{csch}(z) = \sqrt{\frac{1}{z^2}}\, z \sqrt{\coth^2(z)-1} \;/;\; |\operatorname{Im}(z)| < \frac{\pi}{2} \bigwedge \operatorname{Re}(z) \neq 0$$

01.23.27.0054.01

$$\operatorname{csch}(z) = \frac{\sqrt{z^2}}{z} \sqrt{\coth^2(z)-1}\, (-1)^{\left\lfloor \frac{\operatorname{Im}(z)}{\pi} + \frac{1}{2} \right\rfloor} \left(1 - \left(1 + (-1)^{\left\lfloor \frac{1}{2} + \frac{\operatorname{Im}(z)}{\pi} \right\rfloor + \left\lfloor -\frac{\operatorname{Im}(z)}{\pi} - \frac{1}{2} \right\rfloor}\right) \theta(-\operatorname{Re}(z))\right) /;\; \operatorname{Re}(z) \neq 0$$

01.23.27.0055.01

$$\operatorname{csch}^2(z) = \coth^2(z) - 1$$

Involving sech

01.23.27.0056.01

$$\operatorname{csch}(z) = -i \operatorname{sech}\left(\frac{\pi i}{2} - z\right)$$

01.23.27.0057.01

$$\operatorname{csch}(z) = i \operatorname{sech}\left(\frac{\pi i}{2} + z\right)$$

01.23.27.0058.01

$$\operatorname{csch}(z) = \frac{\sqrt{z^2}}{z} \frac{\operatorname{sech}(z)}{\sqrt{1-\operatorname{sech}^2(z)}} \;/;\; \operatorname{Re}(z) \neq 0$$

01.23.27.0059.01

$$\operatorname{csch}^2(z) = \frac{\operatorname{sech}^2(z)}{1-\operatorname{sech}^2(z)}$$

01.23.27.0060.01

$$\operatorname{csch}^2(z) + \operatorname{sech}^2(z) = \frac{\operatorname{csch}^2(z)\left(\operatorname{csch}^2(z)+2\right)}{\operatorname{csch}^2(z)+1}$$

01.23.27.0061.01

$$\operatorname{csch}^2(z) - \operatorname{sech}^2(z) = 4\operatorname{csch}^2(2z)$$

01.23.27.0062.01

$$\operatorname{csch}(z) + i\,\operatorname{sech}(z) = \frac{i\,2\sqrt{2}\,\operatorname{csch}(2z)}{\operatorname{csch}\left(z - \frac{\pi i}{4}\right)}$$

01.23.27.0063.01

$$\operatorname{csch}(z) - i\,\operatorname{sech}(z) = -\frac{i\,2\sqrt{2}\,\operatorname{csch}(2z)}{\operatorname{csch}\left(z + \frac{\pi i}{4}\right)}$$

01.23.27.0064.01

$$\operatorname{csch}(z) + \operatorname{sech}(z) = 2\,e^{z}\,\operatorname{csch}(2z)$$

01.23.27.0065.01

$$\operatorname{csch}(z) - \operatorname{sech}(z) = 2\,e^{-z}\,\operatorname{csch}(2z)$$

01.23.27.0066.01

$$a\,\operatorname{csch}(z) + b\,\operatorname{sech}(z) = 2\,a\sqrt{1 - \frac{b^2}{a^2}}\,\cosh\left(z + \tanh^{-1}\left(\frac{b}{a}\right)\right)\operatorname{csch}(2z)$$

01.23.27.0067.01

$$\operatorname{csch}\left(\frac{\pi i}{2} + z\right) = -i\,\operatorname{sech}(z)$$

01.23.27.0068.01

$$\operatorname{csch}\left(\frac{\pi i}{2} - z\right) = -i\,\operatorname{sech}(z)$$

Involving trigonometric and hyperbolic functions

01.23.27.0069.01

$$\operatorname{csch}^2(z) + \operatorname{sech}^2(z) = 4\coth(2z)\operatorname{csch}(2z)$$

Inequalities

01.23.29.0001.01

$$\operatorname{csch}(x) > \frac{\operatorname{sech}(x)}{x} \;/;\; x > 0 \land x \in \mathbb{R}$$

History

The function csch is encountered often in mathematics and the natural sciences.

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