

# SiegelTheta3

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## Notations

### Traditional name

Siegel theta function

### Traditional notation

$$\Theta \left[ \begin{matrix} \{u_1, \dots, u_r\} \\ \{v_1, \dots, v_r\} \end{matrix} \right] \left( \begin{matrix} m_{1,1} & \dots & m_{1,r} \\ \dots & \dots & \dots \\ m_{r,1} & \dots & m_{r,r} \end{matrix} ; \{s_1, \dots, s_r\} \right)$$

### Mathematica StandardForm notation

SiegelTheta[{{u<sub>1</sub>, ..., u<sub>r</sub>}, {v<sub>1</sub>, ..., v<sub>r</sub>}}, {{m<sub>1,1</sub>, ..., m<sub>1,r</sub>}, ..., {m<sub>r,1</sub>, ..., m<sub>r,r</sub>}}, {s<sub>1</sub>, ..., s<sub>r</sub>}]

## Primary definition

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$$\Theta \left[ \begin{matrix} \{u_1, \dots, u_r\} \\ \{v_1, \dots, v_r\} \end{matrix} \right] \left( \begin{matrix} m_{1,1} & \dots & m_{1,r} \\ \dots & \dots & \dots \\ m_{r,1} & \dots & m_{r,r} \end{matrix} ; \{s_1, \dots, s_r\} \right) = \sum_{n_1=-\infty}^{\infty} \dots \sum_{n_r=-\infty}^{\infty} e^{i\pi((n+u)\cdot\Omega\cdot(n+u)+2(n+u)\cdot(s+v))} /; u = \{u_1, \dots, u_r\} \wedge v = \{v_1, \dots, v_r\} \wedge \Omega = \{\{m_{1,1}, \dots, m_{1,r}\}, \dots, \{m_{r,1}, \dots, m_{r,r}\}\} \wedge s = \{s_1, \dots, s_r\} \wedge n = \{n_1, \dots, n_r\} \wedge n + u = \{n_1 + u_1, \dots, n_r + u_r\} \wedge s + v = \{s_1 + v_1, \dots, s_r + v_r\}$$

The Siegel theta function  $\Theta \left[ \begin{matrix} u \\ v \end{matrix} \right] (\Omega, s)$  with characteristic  $\begin{pmatrix} u \\ v \end{pmatrix} /; u = \{u_1, \dots, u_r\} \wedge v = \{v_1, \dots, v_r\}$ , symmetric Riemann modular matrix  $\Omega = \{\{m_{1,1}, \dots, m_{1,r}\}, \dots, \{m_{r,1}, \dots, m_{r,r}\}\}$  with positive definite imaginary part and vector  $s = \{s_1, \dots, s_r\}$  is defined through  $\sum_{n_1=-\infty}^{\infty} \dots \sum_{n_r=-\infty}^{\infty} e^{i\pi((n+u)\cdot\Omega^T\cdot(n+u)+2(n+u)\cdot(s+v))}$ , where  $\Omega^T$  means transposed to  $\Omega$  matrix (or vector) and  $n$  ranges over all possible vectors in the  $r$ -dimensional integer lattice.

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