# SiegelTheta



## Notations

### Traditional name

Siegel theta function

### Traditional notation

$$\Theta\left(\begin{pmatrix} m_{1,1} & \ldots & m_{1,r} \\ \ldots & \ldots & \ldots \\ m_{r,1} & \ldots & m_{r,r} \end{pmatrix}, \{s_1, \ldots, s_r\}\right)$$

### *Mathematica* StandardForm notation

```
SiegelTheta[{{m1,1, …, m1,r}, …, {mr,1, …, mr,r}}, {s1, …, sr}]
```

## Primary definition

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$$\Theta\left(\begin{pmatrix} m_{1,1} & \ldots & m_{1,r} \\ \ldots & \ldots & \ldots \\ m_{r,1} & \ldots & m_{r,r} \end{pmatrix}, \{s_1, \ldots, s_r\}\right) = \sum_{n_1=-\infty}^{\infty} \ldots \sum_{n_r=-\infty}^{\infty} e^{i\pi(n\cdot\Omega\cdot n + 2 n\cdot s)} \;/;$$

$$\Omega = \{\{m_{1,1}, \ldots, m_{1,r}\}, \ldots, \{m_{r,1}, \ldots, m_{r,r}\}\} \bigwedge s = \{s_1, \ldots, s_r\} \bigwedge n = \{n_1, \ldots, n_r\}$$

The Siegel theta function $\Theta(\Omega, s)$ with symmetric Riemann modular matrix $\Omega = \{\{m_{1,1}, \ldots, m_{1,r}\}, \ldots, \{m_{r,1}, \ldots, m_{r,r}\}\}$ with positive definite imaginary part and vector $s = \{s_1, \ldots, s_r\}$ is defined through $\sum_{n_1=-\infty}^{\infty} \ldots \sum_{n_r=-\infty}^{\infty} e^{i\pi(n\cdot\Omega^T\cdot n+2 n\cdot s)}$, 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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