

factorial() — Factorial and gamma function
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Description

`factorial(R)` returns the elementwise factorial of *R*.

`lnfactorial(R)` returns the elementwise $\ln(\text{factorial}(R))$, calculated differently. Very large values of *R* may be evaluated.

`lngamma(Z)`, for *Z* real, returns the elementwise real result $\ln(\text{abs}(\text{gamma}(Z)))$, but calculated differently. `lngamma(Z)`, for *Z* complex, returns the elementwise $\ln(\text{gamma}(Z))$, calculated differently. Thus, `lngamma(-2.5) = -.056244`, whereas `lngamma(-2.5+0i) = -.056244 + 3.1416i`. In both cases, very large values of *Z* may be evaluated.

`gamma(Z)` returns $\exp(\text{lngamma}(Z))$ for complex arguments and $\text{Re}(\exp(\text{lngamma}(C(Z))))$ for real arguments. Thus `gamma()` can correctly calculate, say, `gamma(-2.5)` even for real arguments.

`digamma(R)` returns the derivative of `lngamma()` for $R > 0$, sometimes called the psi function. `digamma()` requires a real argument.

`trigamma(R)` returns the second derivative of `lngamma()` for $R > 0$. `trigamma()` requires a real argument.

Syntax

real matrix `factorial(real matrix R)`

real matrix `lnfactorial(real matrix R)`

numeric matrix `lngamma(numeric matrix Z)`

numeric matrix `gamma(numeric matrix Z)`

real matrix `digamma(real matrix R)`

real matrix `trigamma(real matrix R)`

Conformability

All functions return a matrix of the same dimension as input, containing element-by-element calculated results.

Diagnostics

`factorial()` returns missing for noninteger arguments, negative arguments, and arguments > 167 .

`lnfactorial()` returns missing for noninteger arguments, negative arguments, and arguments $> 1e+305$.

`lngamma()` returns missing for 0, negative integer arguments, negative arguments $\leq -2,147,483,648$, and arguments $> 1e+305$.

`gamma()` returns missing for real arguments > 171 and for negative integer arguments.

`digamma()` returns missing for 0 and negative integer arguments and for arguments $< -10,000,000$.

`trigamma()` returns missing for 0 and negative integer arguments and for arguments $< -10,000,000$.

Also see

[M-4] **scalar** — Scalar mathematical functions

[M-4] **statistical** — Statistical functions