Title

factorial( ) — Factorial and gamma function

Description Syntax Conformability Diagnostics Also see

Description

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

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

`lngamma(`*Z*`)`, for *Z* real, returns the elementwise real result `ln(abs(gamma(`*Z*`)))`, but calculated differently. `lngamma(`*Z*`)`, for *Z* complex, returns the elementwise `ln(gamma(`*Z*`))`, calculated differently. Thus, `lngamma(-2.5)` $= -0.056244$, whereas `lngamma(-2.5+0i)` $= -0.056244 + 3.1416$i. In both cases, very large values of *Z* may be evaluated.

`gamma(`*Z*`)` returns `exp(lngamma(`*Z*`))` for complex arguments and `Re(exp(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