

**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  $\ln(\text{factorial}(R))$ , 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) = -0.056244`, whereas `lngamma(-2.5+0i) = -0.056244 + 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