factorial() — Factorial and gamma function

Syntax

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<tr>
<th>Type</th>
<th>Function</th>
<th>Description</th>
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<tr>
<td>real matrix</td>
<td>factorial(real matrix R)</td>
<td>returns the elementwise factorial of R.</td>
</tr>
<tr>
<td>real matrix</td>
<td>lnfactorial(real matrix R)</td>
<td>returns the elementwise ln(factorial(R)), calculated differently. Very large values of R may be evaluated.</td>
</tr>
<tr>
<td>numeric matrix</td>
<td>lngamma(numeric matrix Z)</td>
<td>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 + 3.1416i. In both cases, very large values of Z may be evaluated.</td>
</tr>
<tr>
<td>numeric matrix</td>
<td>gamma(numeric matrix Z)</td>
<td>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.</td>
</tr>
<tr>
<td>real matrix</td>
<td>digamma(real matrix R)</td>
<td>returns the derivative of lngamma() for R &gt; 0, sometimes called the psi function. digamma() requires a real argument.</td>
</tr>
<tr>
<td>real matrix</td>
<td>trigamma(real matrix R)</td>
<td>returns the second derivative of lngamma() for R &gt; 0. trigamma() requires a real argument.</td>
</tr>
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</table>

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 + 3.1416i. 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.

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