Title

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exp( ) — Exponentiation and logarithms

Description Syntax Conformability Diagnostics Also see

Description

`exp(`*Z*`)` returns the elementwise exponentiation of *Z*. `exp()` returns real if *Z* is real and complex if *Z* is complex.

`ln(`*Z*`)` and `log(`*Z*`)` return the elementwise natural logarithm of *Z*. The functions are synonyms. `ln()` and `log()` return real if *Z* is real and complex if *Z* is complex.

`ln(`*x*`)`, *x* real, returns the natural logarithm of *x* or returns missing (`.`) if $x \leq 0$.

`ln(`*z*`)`, *z* complex, returns the complex natural logarithm of *z*. Im(`ln()`) is chosen to be in the interval $(-pi, pi]$.

`log10(`*Z*`)` returns the elementwise log base 10 of *Z*. `log10()` returns real if *Z* is real and complex if *Z* is complex. `log10(`*Z*`)` is defined mathematically and operationally as `ln(`*Z*`)/ln(10)`.

`expm1(`*Z*`)` returns `exp(`*z*`)` $-$ 1 for every element *z* of real matrix *Z*. `expm1(`*z*`)` is more accurate than `exp(`*z*`)` $-$ 1 for small values of $|z|$.

`ln1p(`*Z*`)` and `log1p(`*Z*`)` return `log(`1 $+$ *z*`)` for every element *z* of real matrix *Z*. The functions are synonyms. `ln1p(`*z*`)` is more accurate than `ln(`1 $+$ *z*`)` for small values of $|z|$.

`ln1m(`*Z*`)` and `log1m(`*Z*`)` return `log(`1 $-$ *z*`)` for every element *z* of real matrix *Z*. The functions are synonyms. `ln1m(`*z*`)` is more accurate than `ln(`1 $-$ *z*`)` for small values of $|z|$.

Syntax

numeric matrix `exp(`*numeric matrix Z*`)`

numeric matrix `ln(`*numeric matrix Z*`)`

numeric matrix `log(`*numeric matrix Z*`)`

numeric matrix `log10(`*numeric matrix Z*`)`

numeric matrix `expm1(`*numeric matrix Z*`)`

numeric matrix `ln1p(`*numeric matrix Z*`)`

numeric matrix `log1p(`*numeric matrix Z*`)`

numeric matrix `ln1m(`*numeric matrix Z*`)`

numeric matrix `log1m(`*numeric matrix Z*`)`

Conformability

`exp(`*Z*`)`, `ln(`*Z*`)`, `log(`*Z*`)`, `log10(`*Z*`)`, `expm1(`*Z*`)`, `ln1p(`*Z*`)`, `log1p(`*Z*`)`, `ln1m(`*Z*`)`, `log1m(`*Z*`)`:

Z:	$r \times c$
result:	$r \times c$

Diagnostics

`exp(`*Z*`)` returns missing when Re(*Z*) $>$ 709.

`ln(`*Z*`)`, `log(`*Z*`)`, and `log10(`*Z*`)` return missing when *Z* is real and $Z \leq 0$. In addition, the functions return missing (`.`) for real arguments when the result would be complex. For instance, `ln(-1)` = `.`, whereas `ln(-1+0i)` = 3.14159265i.

`expm1(`*Z*`)` returns missing when $Z > 709$.

`ln1p(`z`)` and `log1p(`z`)` return missing when $1 + z \leq 0$.

`ln1m(`z`)` and `log1m(`z`)` return missing when $1 - z \leq 0$.

Also see

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