

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 $\text{Re}(Z) > 709$.

`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

Stata, Stata Press, and Mata are registered trademarks of StataCorp LLC. Stata and Stata Press are registered trademarks with the World Intellectual Property Organization of the United Nations. StataNow and NetCourseNow are trademarks of StataCorp LLC. Other brand and product names are registered trademarks or trademarks of their respective companies. Copyright © 1985–2025 StataCorp LLC, College Station, TX, USA. All rights reserved.

For suggested citations, see the FAQ on [citing Stata documentation](#).

