Title

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Trigonometric functions

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Contents

acos(x)	the radian value of the arccosine of x
acosh(x)	the inverse hyperbolic cosine of x
asin(x)	the radian value of the arcsine of x
asinh(x)	the inverse hyperbolic sine of x
atan(x)	the radian value of the arctangent of x
atan2(y, x)	the radian value of the arctangent of y/x, where the signs of the parameters y and x are used to determine the quadrant of the answer
atanh(x)	the inverse hyperbolic tangent of x
cos(x)	the cosine of x, where x is in radians
cosh(x)	the hyperbolic cosine of x
sin(x)	the sine of x, where x is in radians
sinh(x)	the hyperbolic sine of x
tan(x)	the tangent of x, where x is in radians
tanh(x)	the hyperbolic tangent of x

Functions

acos(x)
Description: the radian value of the arccosine of x
Domain: -1 to 1
Range: 0 to π

acosh(x)
Description: the inverse hyperbolic cosine of x
acosh(x) $= \ln(x + \sqrt{x^2 - 1})$
Domain: 1 to 8.9e+307
Range: 0 to 709.77

asin(x)
Description: the radian value of the arcsine of x
Domain: -1 to 1
Range: $-\pi/2$ to $\pi/2$

asinh(x)
Description: the inverse hyperbolic sine of x
asinh(x) $= \ln(x + \sqrt{x^2 + 1})$
Domain: $-$8.9e+307 to 8.9e+307
Range: $-$709.77 to 709.77

`atan(`x`)`
Description: the radian value of the arctangent of x
Domain: $-$8e+307 to 8e+307
Range: $-\pi/2$ to $\pi/2$

`atan2(`y`, `x`)`
Description: the radian value of the arctangent of y/x, where the signs of the parameters y and x are used to determine the quadrant of the answer
Domain y: $-$8e+307 to 8e+307
Domain x: $-$8e+307 to 8e+307
Range: $-\pi$ to π

`atanh(`x`)`
Description: the inverse hyperbolic tangent of x
$\texttt{atanh}(x) = \frac{1}{2}\{\ln(1+x) - \ln(1-x)\}$
Domain: -1 to 1
Range: $-$8e+307 to 8e+307

`cos(`x`)`
Description: the cosine of x, where x is in radians
Domain: $-$1e+18 to 1e+18
Range: -1 to 1

`cosh(`x`)`
Description: the hyperbolic cosine of x
$\texttt{cosh}(x) = \{\exp(x) + \exp(-x)\}/2$
Domain: $-$709 to 709
Range: 1 to 4.11e+307

`sin(`x`)`
Description: the sine of x, where x is in radians
Domain: $-$1e+18 to 1e+18
Range: -1 to 1

`sinh(`x`)`
Description: the hyperbolic sine of x
$\texttt{sinh}(x) = \{\exp(x) - \exp(-x)\}/2$
Domain: $-$709 to 709
Range: $-$4.11e+307 to 4.11e+307

`tan(`x`)`
Description: the tangent of x, where x is in radians
Domain: $-$1e+18 to 1e+18
Range: $-$1e+17 to 1e+17 or *missing*

`tanh(`x`)`
Description: the hyperbolic tangent of x
$\texttt{tanh}(x) = \{\exp(x) - \exp(-x)\}/\{\exp(x) + \exp(-x)\}$
Domain: $-$8e+307 to 8e+307
Range: -1 to 1 or *missing*

❑ Technical note

The trigonometric functions are defined in terms of *radians*. There are 2π radians in a circle. If you prefer to think in terms of *degrees*, because there are also 360 degrees in a circle, you may convert degrees into radians by using the formula $r = d\pi/180$, where d represents degrees and r represents radians. Stata includes the built-in constant `_pi`, equal to π to machine precision. Thus, to calculate the sine of `theta`, where `theta` is measured in degrees, you could type

```
sin(theta*_pi/180)
```

`atan()` similarly returns radians, not degrees. The arccotangent can be obtained as

acot(x) =`_pi/2 - atan(`x`)`

❑

References

Norton, E. C. 2022. The inverse hyperbolic sine transformation and retransformed marginal effects. *Stata Journal* 22: 702–712.

Oldham, K. B., J. C. Myland, and J. Spanier. 2009. *An Atlas of Functions*. 2nd ed. New York: Springer.

Also see

[FN] **Functions by category**

[D] **egen** — Extensions to generate

[D] **generate** — Create or change contents of variable

[M-5] **sin( )** — Trigonometric and hyperbolic functions

[U] **13.3 Functions**