

## Trigonometric functions

[Contents](#)[Functions](#)[Reference](#)[Also see](#)

## Contents

<code>acos(x)</code>	the radian value of the arccosine of $x$
<code>acosh(x)</code>	the inverse hyperbolic cosine of $x$
<code>asin(x)</code>	the radian value of the arcsine of $x$
<code>asinh(x)</code>	the inverse hyperbolic sine of $x$
<code>atan(x)</code>	the radian value of the arctangent of $x$
<code>atan2(y, x)</code>	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
<code>atanh(x)</code>	the inverse hyperbolic tangent of $x$
<code>cos(x)</code>	the cosine of $x$ , where $x$ is in radians
<code>cosh(x)</code>	the hyperbolic cosine of $x$
<code>sin(x)</code>	the sine of $x$ , where $x$ is in radians
<code>sinh(x)</code>	the hyperbolic sine of $x$
<code>tan(x)</code>	the tangent of $x$ , where $x$ is in radians
<code>tanh(x)</code>	the hyperbolic tangent of $x$

## Functions

`acos(x)`  
 Description: the radian value of the arccosine of  $x$   
 Domain:  $-1$  to  $1$   
 Range:  $0$  to  $\pi$

`acosh(x)`  
 Description: the inverse hyperbolic cosine of  $x$   

$$\operatorname{acosh}(x) = \ln(x + \sqrt{x^2 - 1})$$
 Domain:  $1$  to  $8.9\text{e}+307$   
 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  $x$   

$$\operatorname{asinh}(x) = \ln(x + \sqrt{x^2 + 1})$$
 Domain:  $-8.9\text{e}+307$  to  $8.9\text{e}+307$   
 Range:  $-709.77$  to  $709.77$

## 2 Trigonometric functions

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### **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  $\pi$

### **atanh**( $x$ )

Description: the inverse hyperbolic tangent of  $x$

$$\operatorname{atanh}(x) = \frac{1}{2} \{ \ln(1+x) - \ln(1-x) \}$$

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  $x$

$$\operatorname{cosh}(x) = \{ \exp(x) + \exp(-x) \} / 2$$

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  $x$

$$\operatorname{sinh}(x) = \{ \exp(x) - \exp(-x) \} / 2$$

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  $x$

$$\operatorname{tanh}(x) = \{ \exp(x) - \exp(-x) \} / \{ \exp(x) + \exp(-x) \}$$

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  $2\pi$  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  $\pi$  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)
```

□

## Reference

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](#)