Trigonometric functions

Contents

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

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

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

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

- **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 \( x \)
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 $x$
\[
\text{atanh}(x) = \frac{1}{2} \left\{ \ln(1 + x) - \ln(1 - x) \right\}
\]
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 $x$
\[
\cosh(x) = \frac{\exp(x) + \exp(-x)}{2}
\]
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 $x$
\[
\sinh(x) = \frac{\exp(x) - \exp(-x)}{2}
\]
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 $x$
\[
\tanh(x) = \frac{\exp(x) - \exp(-x)}{\exp(x) + \exp(-x)}
\]
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

\[
\arccot(x) = \pi/2 - \arctan(x)
\]

Reference


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