

# ATANH Function

Computes the arctangent of an input value for a hyperbolic angle measured in radians. The value can be a Decimal or Integer literal or a reference to a column containing numeric values.

A **hyperbola** is the shape created by taking a planar slice of two cones whose tips are touching each other. For two identical cones, the curves of the slices mirror each other, no matter the angle of the plane through the cones.

- The two slices represent the set of points on a grid such that:

$$x^2 - y^2 = k$$

where  $k$  is some constant.

- The hyperbolic trigonometric functions measure trigonometric calculations for the right-side ( $x > 0$ ) slice of the hyperbola.
- For more information, see <https://en.wikipedia.org/wiki/Hyperbola>.

The hyperbolic arctangent (ATANH) function is computed using the following formula:

$$\tanh^{-1} z = \frac{1}{2} \ln\left(\frac{1+z}{1-z}\right)$$

You can convert from degrees to radians. For more information, see *RADIANS Function*.

## Basic Usage

### Numeric literal example:

```
round(degrees(atanh(0.5)), 2)
```

**Output:** Returns the computation of the hyperbolic angle in radians whose tangent is 0.5. The output value is rounded to two decimals: 31.47.

### Column reference example:

```
atanh(x)
```

**Output:** Returns the hyperbolic angle the tangent value for which is stored in radians in  $x$  column.

## Syntax and Arguments

```
atanh(numeric_value)
```

Argument	Required?	Data Type	Description
numeric_value	Y	string, decimal, or integer	Name of column, Decimal or Integer literal, or function returning those types to apply to the function

For more information on syntax standards, see *Language Documentation Syntax Notes*.

## numeric\_value

Name of the column, Integer or Decimal literal, or function returning that data type to apply to the function.

- Missing input values generate missing results.
- Literal numeric values should not be quoted. Quoted values are treated as strings.
- Multiple columns and wildcards are not supported.

### Usage Notes:

Required?	Data Type	Example Value
Yes	String (column reference) or Integer or Decimal literal	0 . 5

## Examples

**Tip:** For additional examples, see *Common Tasks*.

### Example - Hyperbolic arc trigonometry functions

This example illustrates how to apply inverse (arc) hyperbolic functions to your transformations.

- **Hyperbolic arcsine.** See *ASINH Function*.
- **Hyperbolic arccosine.** See *ACOSH Function*.
- **Hyperbolic arctangent.** See *ATANH Function*.

### Source:

In the following sample, input values are in radians. In this example, all values are rounded to two decimals for clarity.

Y
-4.00
-3.00
-2.00
-1.00
-0.75
-0.50
0.00
0.50
0.75
1.00
2.00
3.00
4.00

### Transformation:

The following transformations include checks for the valid ranges for input values.

Hyperbolic arcsine:

<b>Transformation Name</b>	New formula
<b>Parameter: Formula type</b>	Single row formula
<b>Parameter: Formula</b>	round(degrees(asinh(Y)), 2)
<b>Parameter: New column name</b>	'asinhY'

Hyperbolic arccosine:

Valid over the range ( $y > 1$ )

<b>Transformation Name</b>	New formula
<b>Parameter: Formula type</b>	Single row formula
<b>Parameter: Formula</b>	if(Y>1,round(degrees(acosh(Y)), 2),null())
<b>Parameter: New column name</b>	'acoshY'

Hyperbolic arctangent:

Valid over the range ( $-1 < y < 1$ )

<b>Transformation Name</b>	New formula
<b>Parameter: Formula type</b>	Single row formula
<b>Parameter: Formula</b>	if(abs(y)<1,round(degrees(atanh(Y)), 2),null())
<b>Parameter: New column name</b>	'atanhY'

**Results:**

Y	atanhY	acoshY	asinhY
-4	null	null	-120.02
-3	null	null	-104.19
-2	null	null	-82.71
-1.5	null	null	-68.45
-1	null	null	-50.5
-0.75	-55.75	null	-39.71
-0.5	-31.47	null	-27.57
0	0	null	0
0.5	31.47	null	27.57
0.75	55.75	null	39.71
1	null	null	50.5

1.5	<i>null</i>	55.14	68.45
2	<i>null</i>	75.46	82.71
3	<i>null</i>	101	104.19
4	<i>null</i>	118.23	120.02