

# TANH Function

Computes the hyperbolic tangent 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 tangent (TANH) function is computed using the following formula:

$$\tanh z = \frac{\sinh z}{\cosh z}$$

## Hyperbolic cotangent:

The hyperbolic cotangent is the following:

$$\coth z = \frac{\cosh z}{\sinh z}$$

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

**Wrangle vs. SQL:** This function is part of Wrangle, a proprietary data transformation language. Wrangle is not SQL. For more information, see *Wrangle Language*.

## Basic Usage

### Numeric literal example:

```
round(tanh(radians(30)), 3)
```

**Output:** Returns the computation of the hyperbolic tangent of a 30-degree angle, which is converted to radians before being passed to the TANH function. The output value is rounded to three decimals: 0.548.

### Column reference example:

```
tanh(X)
```

**Output:** Returns the hyperbolic tangent of the radians values in x column.

## Syntax and Arguments

```
tanh(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 trigonometry functions

This example illustrates how to apply hyperbolic trigonometric functions to your transformations. All of the functions take inputs in radians:

- **Hyperbolic Sine.** See *SINH Function*.
- **Hyperbolic Cosine.** See *COSH Function*.
- **Hyperbolic Tangent.** See *TANH Function*.
- **Hyperbolic Cotangent.** Computed as  $1/\text{TANH}$ .
- **Hyperbolic Secant.** Computed as  $1/\text{COSH}$ .
- **Hyperbolic Cosecant.** Computed as  $1/\text{SINH}$ .

### Source:

In the following sample, input values are in degrees:

X
-30
0

30
45
60
90
120
135
180

**Transformation:**

In this example, all values are rounded to three decimals for clarity.

First, the above values in degrees must be converted to radians.

<b>Transformation Name</b>	New formula
<b>Parameter: Formula type</b>	Single row formula
<b>Parameter: Formula</b>	round(radians(X), 3)
<b>Parameter: New column name</b>	'rX'

Hyperbolic Sine:

<b>Transformation Name</b>	New formula
<b>Parameter: Formula type</b>	Single row formula
<b>Parameter: Formula</b>	round(sinh(rX), 3)
<b>Parameter: New column name</b>	'SINHrX'

Hyperbolic Cosine:

<b>Transformation Name</b>	New formula
<b>Parameter: Formula type</b>	Single row formula
<b>Parameter: Formula</b>	round(cosh(rX), 3)
<b>Parameter: New column name</b>	'COSHrX'

Hyperbolic Tangent:

<b>Transformation Name</b>	New formula
<b>Parameter: Formula type</b>	Single row formula
<b>Parameter: Formula</b>	round(tanh(rX), 3)
<b>Parameter: New column name</b>	'TANHrX'

Hyperbolic Cotangent:

<b>Transformation Name</b>	New formula
<b>Parameter: Formula type</b>	Single row formula
<b>Parameter: Formula</b>	<code>round(divide(1, tanh(rX)), 3)</code>
<b>Parameter: New column name</b>	'COThrX'

Hyperbolic Secant:

<b>Transformation Name</b>	New formula
<b>Parameter: Formula type</b>	Single row formula
<b>Parameter: Formula</b>	<code>round(divide(1, cosh(rX)), 3)</code>
<b>Parameter: New column name</b>	'SEChrX'

Hyperbolic Cosecant:

<b>Transformation Name</b>	New formula
<b>Parameter: Formula type</b>	Single row formula
<b>Parameter: Formula</b>	<code>round(divide(1, sinh(rX)), 3)</code>
<b>Parameter: New column name</b>	'CSChrX'

Results:

X	rX	TANHrX	COThrX	COSHrX	SEChrX	SINHrX	CSChrX
-30	-0.524	-0.481	-2.079	1.14	0.877	-0.548	-1.825
0	0	0	<i>null</i>	1	1	0	<i>null</i>
30	0.524	0.481	2.079	1.14	0.877	0.548	1.825
45	0.785	0.656	1.524	1.324	0.755	0.868	1.152
60	1.047	0.781	1.28	1.6	0.625	1.249	0.801
90	1.571	0.917	1.091	2.51	0.398	2.302	0.434
120	2.094	0.97	1.031	4.12	0.243	3.997	0.25
135	2.356	0.982	1.018	5.322	0.188	5.227	0.191
180	3.142	0.996	1.004	11.597	0.086	11.553	0.087