

## 1 Introduction

Hyperbolic functions are defined in terms of exponentials, they are expressed as a relationship between the distances from a point on a hyperbola to the origin and to the coordinate axes as hyperbolic sine and hyperbolic cosine.

**Definition:** The hyperbolic sine function is defined as:

$$\sinh(x) = \frac{e^x - e^{-x}}{2}$$

e is the base of the natural logarithm Log.

## 2 Domain & Co-Domain

$\sinh(x)$  decreases exponentially as  $x$  approaches  $-\infty$  and increases exponentially as  $x$  approaches  $+\infty$ . The range of sine function is all real numbers and from -1 to +1 inclusive.

## 3 Characteristics

### 3.1 Parity

$\sinh(x)$  is an odd function.  $\sinh(-x) = -\sinh(x)$

### 3.2 Mirror Symmetry

$$\sinh(\overline{z}) = \overline{\sinh(z)}$$

### 3.3 Periodicity

$\sinh(x)$  is a periodic function with period  $2\pi i$

## 4 References

1. <http://functions.wolfram.com/ElementaryFunctions/Sinh/04/>
2. <http://math.feld.cvut.cz/mt/txtb/4/txe3ba4f.htm>
3. <https://reference.wolfram.com/language/ref/Sinh.html>
4. <http://mathonweb.com/helpebook/html/functions1.htm>