**Hyperbolic Sine Functions**

**Introduction**

A hyperbolic sine function is a mathematical operation that calculates the ratio value of the difference of two exponential function: . It was first introduced by the mathematician and astronomer Vincenzo Riccati in 1757 (Abramowitz, 1972) . The hyperbolic sine function plays a crucial role in modern mathematics and finds diverse applications in various fields such as physics, engineering, statistics, and finance.

**Motivation**

Hyperbolic sine function was invented as a tool for hyperbolic geometry. It’s being used in solving calculus, differential equations, and physic problems. It’s being used in solving hyperbolic functions, combing with the ‘cosh’ hyperbolic cosine, and deriving the ‘tanh’ hyperbolic tangent.

**Definition**

Given one number x where x belongs to the set of all real numbers,

The Hyperbolic sine of x respect to the unique real number y that can be defined as:

y =

In mathematical notation, this is written as:

Where ‘e’ is the mathematical constant approximately equal to ‘2.71828’.

**Graphical Representation**

Chart, line chart

Description automatically generated

Figure1: Graph of hyper sine function. (Weisstein, 2023)

**Applications**

Hyperbolic sine functions have been widely used in the calculations of angles and distances in hyperbolic geometry. It became useful in probability theory and statics, including the modeling of random variables. It also appears in the modeling of non-Euclidean geometries and the study of hyperbolic surfaces’ behavior. (Zwillinger, 1995)

# References

Abramowitz, M. a. (1972). Hyperbolic Functions. In *Handbook of Mathematical Functions with Formulas, Graphs, and Mathematical Tables, 9th printing* (pp. 83-86). New York.

Weisstein, E. (2023, 2). *Hyperbolic Sine*. From MathWorld--A Wolfram Web Resource: http://mathworld.wolfram.com/HyperbolicSine.html

Zwillinger, D. (. (1995). Hyperbolic Functions. In *CRC Standard Mathematical Tables and Formulae* (pp. 476-481). Boca Raton: CRC Press.