

1.6: Hyperbolic Functions

The hyperbolic functions are important functions defined in terms of exponentials:

$$\sinh(x) = \frac{1}{2}(e^x - e^{-x}) \quad (1.6.1)$$

$$\cosh(x) = \frac{1}{2}(e^x + e^{-x}) \quad (1.6.2)$$

$$\tanh(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}} \quad (1.6.3)$$

They have properties that are intriguingly similar to the trigonometric functions, such as:

$$\sinh(x + y) = \sinh(x) \cosh(y) + \cosh(x) \sinh(y) \quad (1.6.4)$$

$$\cosh(x + y) = \cosh(x) \cosh(y) + \sinh(x) \sinh(y) \quad (1.6.5)$$

Because of these identities, it is sometimes more convenient to work with hyperbolic functions rather than exponentials. During this course, we will learn about the intricate relationship between the hyperbolic and trigonometric functions.

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