

A Refresher on Hyperbolic Trig for Math 230

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Hyperbolic Trigonometric functions behave very much like "normal" trigonometric functions. They are defined in very similar ways and have some similar behavior, most of which is beyond the scope of this class. We will focus on the basic ideas we will need for this class. First we will define the two main hyperbolic trig functions, \sinh and \cosh .

$$\begin{aligned}\sinh(x) &= \frac{e^x + e^{-x}}{2} \\ \cosh(x) &= \frac{e^x - e^{-x}}{2}\end{aligned}\tag{1}$$

The other hyperbolic trig functions are analogous to the normal trig functions, for example $\tanh(x) = \frac{\sinh(x)}{\cosh(x)}$.

Derivatives:

$$\begin{aligned}\frac{d}{dx}\sinh(x) &= \cosh(x) \\ \frac{d}{dx}\cosh(x) &= \sinh(x)\end{aligned}\tag{2}$$

There is one main identity to remember from hyperbolic trig functions, it is very similar to the Pythagorean Identity in normal trig:

$$\cosh^2(x) - \sinh^2(x) = 1$$

For more hyperbolic fun, see p.477 of Edwards Penney's Calculus text.