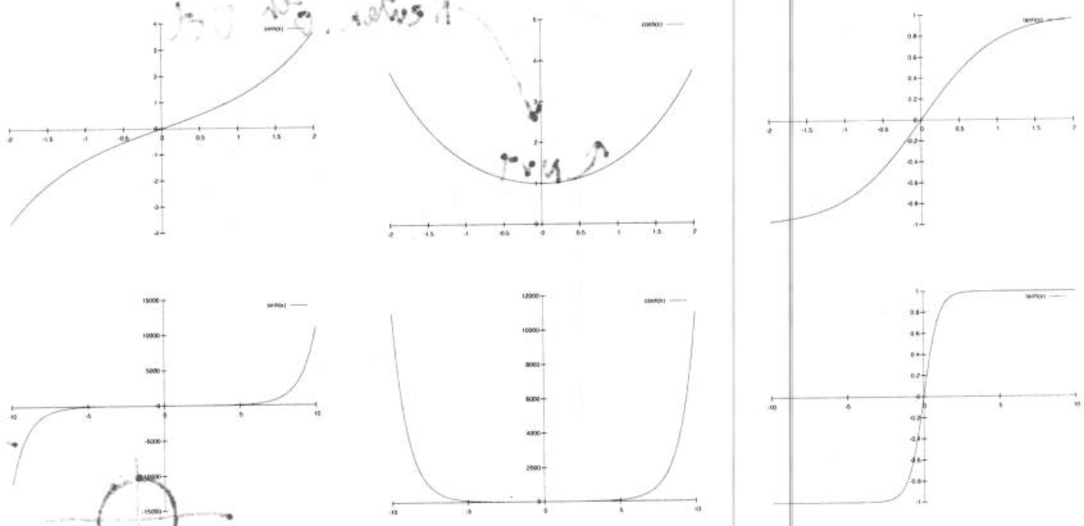
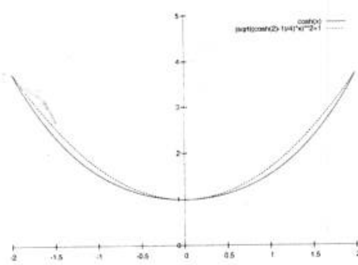


Catenary; hanging string/cable; sturdy arch.



Fundamental identity: $\boxed{\cosh^2 - \sinh^2 = 1}$

$$\cosh^2(x) - \sinh^2(x) = \frac{e^{2x}+2+e^{-2x}}{4} - \frac{e^{2x}-2+e^{-2x}}{4} = \frac{4}{4} = 1$$

Special relativity (Minkowski metric): FIXME: err, can I explain this briefly? No.

Derivatives:

$$\frac{d}{dx}\cosh(x) = \frac{e^x - e^{-x}}{2} = \sinh(x)$$
$$\frac{d}{dx}\sinh(x) = \frac{e^x + e^{-x}}{2} = \cosh(x)$$

$$\frac{d}{dx}\cosh(x) = \frac{d}{dx}\frac{e^x+e^{-x}}{2} = \frac{e^x - e^{-x}}{2} = \sinh(x)$$

(So $\cosh'' = \cosh$ and $\sinh'' = \sinh$)

$$\frac{d}{dx}\tanh(x) = \frac{\sinh'(x)\cosh(x) - \sinh(x)\cosh'(x)}{\cosh^2(x)} = \frac{\cosh^2(x) - \sinh^2(x)}{\cosh^2(x)} = \frac{1}{\cosh^2(x)}$$