# Mathematical equations of hyperbel functions

**See:** ***Papula, L., (2003), Mathematische Formelsammlung, Vieweg***

$$\sinh(x) = \frac{e^{x} - e^{-x}}{2} \quad [1], \qquad \cosh(x) = \frac{e^{x} + e^{-x}}{2} \quad [2]$$

$$\tanh(x) = \frac{\sinh(x)}{\cosh(x)} = \frac{e^{x} - e^{-x}}{e^{x} + e^{-x}} \quad [3]$$

$$\tanh(x/2) = \frac{\sinh(x)}{\cosh(x)+1} = \frac{\cosh(x)+1}{\sinh(x)} = \frac{e^{x/2} - e^{-x/2}}{e^{x/2} + e^{-x/2}} \quad [4]$$

$$\sinh^2(x) + \cosh^2(x) = 1 \quad [5]$$