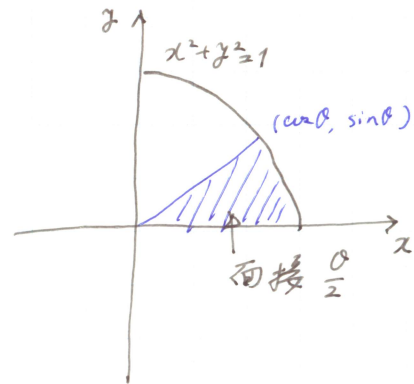
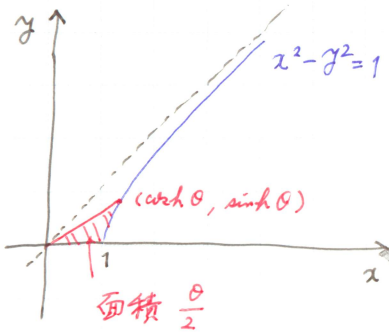


$$\tanh(x) = \frac{\sinh(x)}{\cosh(x)}$$

ハイパーボリック・タンジェント
双曲線 正接



$$\sinh x = \frac{e^x - e^{-x}}{2}, \quad \cosh x = \frac{e^x + e^{-x}}{2}$$

$$\sinh' x = \frac{e^x + e^{-x}}{2}, \quad \cosh' x = \frac{e^x - e^{-x}}{2}$$

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

$$\tanh' x = \sinh' x \cdot \cosh^{-1} x - \sinh x \cdot \cosh^{-2} x \cdot \cosh' x$$

$$= 1 - \frac{\sinh^2 x}{\cosh^2 x}$$

$$= 1 - \tanh^2 x$$