$\sinh x = \dfrac{e^x - e^{-x}}{2}$ $\cosh x = \dfrac{e^x + e^{-x}}{2}$

sinh(x) cosh(x)

[o][e] FIND THE SIGN + SIZE OF $\sinh x$

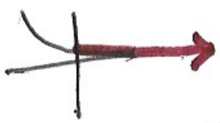
AS $x \to \infty$ AND AS $x \to -\infty$

e^x

$e^x \to \infty$

$e^{-x} \to 0$

e^{-x}



$e^x - e^{-x} \to \infty - 0$

$\to \infty$

$\sinh x = \dfrac{e^x - e^{-x}}{2} \to \dfrac{\infty}{2} \to \infty$

AS $x \to \infty$, $\sinh x \to \infty$

[1] [a] $\sinh(-x)$

$$= \frac{e^{-x} - e^{-(-x)}}{2}$$

$$= \frac{e^{-x} - e^{x}}{2}$$

$$= -\sinh x$$

$\downarrow$

$\sinh(-x) = -\sinh x$

$\sinh x$ IS ALSO ODD,

AND ITS GRAPH IS SYM OVER ORIGIN

$\sin(-x) = -\sin x$

$\sin x$ IS AN ODD FUNCTION,

AND ITS GRAPH IS SYMMETRIC

OVER THE ORIGIN

[1][c] $\cosh^2 x + \sinh^2 x$

$$= \left(\frac{e^x + e^{-x}}{2}\right)^2 + \left(\frac{e^x - e^{-x}}{2}\right)^2$$

$$= \frac{e^{2x} + 2 + e^{-2x}}{4} + \frac{e^{2x} - 2 + e^{-2x}}{4}$$

$$= \frac{2e^{2x} + 2e^{-2x}}{4}$$

$$= \frac{\cancel{2}(e^{2x} + e^{-2x})}{\cancel{4}\,2}$$

$$= \frac{e^{2x} + e^{-2x}}{2} \neq 1$$

$$= \cosh 2x$$

$\cosh^2 x + \sinh^2 x = \cosh 2x$

$\cos^2 x + \sin^2 x = 1$

$(A+B)^2 = A^2 + 2AB + B^2$

$(A-B)^2 = A^2 - 2AB + B^2$

$(b^m)^n = b^{mn}$

$b^m b^n = b^{m+n}$

SIMILAR TO, BUT NOT QUITE

$\cos 2x = \cos^2 x - \sin^2 x$

? $\cosh^2 x - \sinh^2 x = 1 \leftarrow$ [d] HOMEWORK

[l] $\cosh(\ln 3) = \dfrac{e^{\ln 3} - e^{-\ln 3}}{2}$

$= \dfrac{\left(3 - \frac{1}{3}\right)}{2} \cdot \dfrac{3}{3}$

$= \dfrac{9 - 1}{6}$

$= \dfrac{\cancel{8}^{4}}{\cancel{6}_{3}}$

$= \dfrac{4}{3}$

$e^{\ln A} = A$

$e^{-\ln A}$

$= \dfrac{1}{e^{\ln A}} = \dfrac{1}{A}$

$2^{-3} = \dfrac{1}{2^3}$

$\neq -2^3$

$e^{-\ln A} = e^{(-1)(\ln A)}$

$= e^{(\ln A)(-1)}$

$= \left(e^{\ln A}\right)^{-1}$

$= A^{-1}$

$(e^A)^B = e^{AB}$