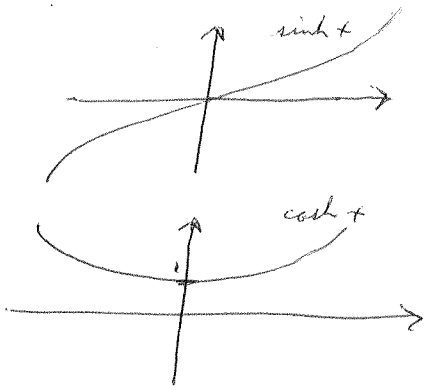
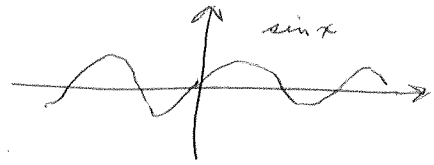
Facts about the sinh and cosh functions

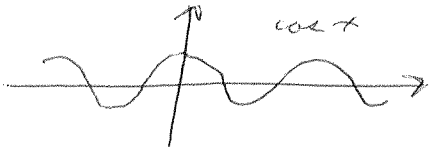
Defn: $\sinh x = \dfrac{e^{x} - e^{-x}}{2}$ $\qquad$ $\sin x = \dfrac{e^{+ix} - e^{-ix}}{2i}$

$\cosh x = \dfrac{e^{x} + e^{-x}}{2}$ $\qquad$ $\cos x = \dfrac{e^{ix} + e^{-ix}}{2}$

Graph:







Derivative:

$\dfrac{d}{dx} \sinh x = \cosh x$ $\qquad$ $\dfrac{d}{dx} \sin x = \cos x$

$\dfrac{d}{dx} \cosh x = +\sinh x$ $\qquad$ $\dfrac{d}{dx} \cos x = -\sin x$

Identity:

$\cosh^2 x - \sinh^2 x = 1$ $\qquad$ $\sin^2 x + \cos^2 x = 1$

Relationship:

$\sinh(ix) = i \sin x$ $\qquad$ $\sin(ix) = i \sinh x$

$\cosh(ix) = \cos x$ $\qquad$ $\cos(ix) = \cosh x$

Eulers Formula:

$\cosh x + \sinh x = e^{x}$ $\qquad$ $\cos x + i \sin x = e^{ix}$