

MATH153 - Homework 7

due April 26 at 12.30

For any real x the hyperbolic cosine, $\cosh x$, and the hyperbolic sine, $\sinh x$, are defined by

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

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

1. Show that $\frac{d}{dx} \cosh x = \sinh x$ and $\frac{d}{dx} \sinh x = \cosh x$
2. show that $\lim_{x \rightarrow \infty} \left(\frac{\sinh x}{\cosh x} \right) = 1$
3. show that $\lim_{x \rightarrow -\infty} \left(\frac{\sinh x}{\cosh x} \right) = -1$
4. Find $\sinh^{-1} x$
(Your answer should be $\sinh^{-1} x = \ln(x + \sqrt{x^2 + 1})$.)

Note: $\lim_{x \rightarrow \infty} a^x = 0$ if $0 < a < 1$