

Hyperbolic Sine

In this problem we study the hyperbolic sine function:

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

reviewing techniques from several parts of the course.

- a) Sketch the graph of $y = \sinh x$ by finding its critical points, points of inflection, symmetries, and limits as $x \rightarrow \infty$ and $-\infty$.
- b) Give a suitable definition for $\sinh^{-1} x$ (the inverse hyperbolic sine) and sketch its graph, indicating the domain of definition.
- c) Find $\frac{d}{dx} \sinh^{-1} x$.
- d) Use your work to evaluate $\int \frac{dx}{\sqrt{a^2 + x^2}}$.

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18.01SC Single Variable Calculus
Fall 2010

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