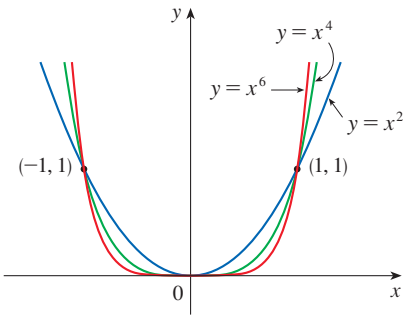
REFERENCE page 3

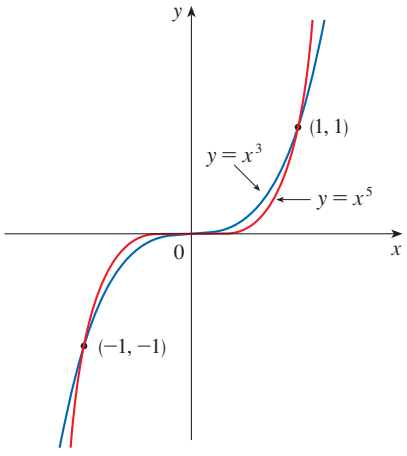
SPECIAL FUNCTIONS

Power Functions $f(x) = x^a$

(i) $f(x) = x^n$, n a positive integer

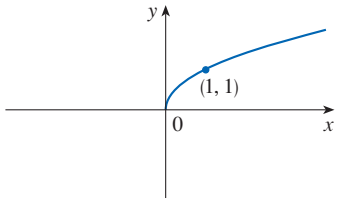


n even

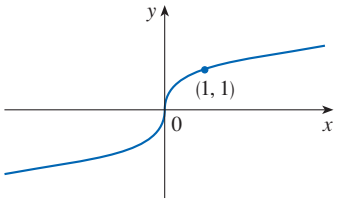


n odd

(ii) $f(x) = x^{1/n} = \sqrt[n]{x}$, n a positive integer

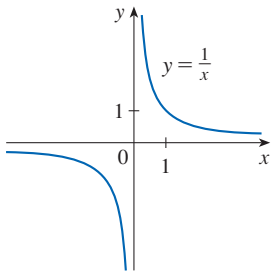


$f(x) = \sqrt{x}$



$f(x) = \sqrt[3]{x}$

(iii) $f(x) = x^{-1} = \dfrac{1}{x}$

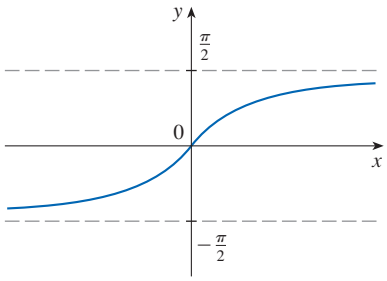


Inverse Trigonometric Functions

$\arcsin x = \sin^{-1} x = y \iff \sin y = x \quad \text{and} \quad -\dfrac{\pi}{2} \leqslant y \leqslant \dfrac{\pi}{2}$

$\arccos x = \cos^{-1} x = y \iff \cos y = x \quad \text{and} \quad 0 \leqslant y \leqslant \pi$

$\arctan x = \tan^{-1} x = y \iff \tan y = x \quad \text{and} \quad -\dfrac{\pi}{2} < y < \dfrac{\pi}{2}$



$y = \tan^{-1} x = \arctan x$

$\lim_{x \to -\infty} \tan^{-1} x = -\dfrac{\pi}{2}$

$\lim_{x \to \infty} \tan^{-1} x = \dfrac{\pi}{2}$

REFERENCE page 4

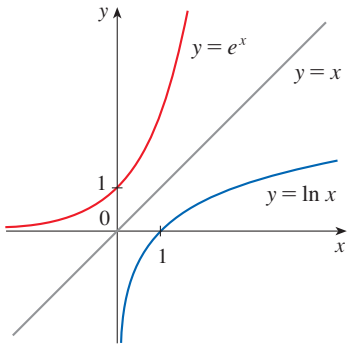
SPECIAL FUNCTIONS

Exponential and Logarithmic Functions

$\log_b x = y \iff b^y = x$

$\ln x = \log_e x, \quad \text{where} \quad \ln e = 1$

$\ln x = y \iff e^y = x$



$\lim_{x \to -\infty} e^x = 0$ $\quad$ $\lim_{x \to \infty} e^x = \infty$

$\lim_{x \to 0^+} \ln x = -\infty$ $\quad$ $\lim_{x \to \infty} \ln x = \infty$

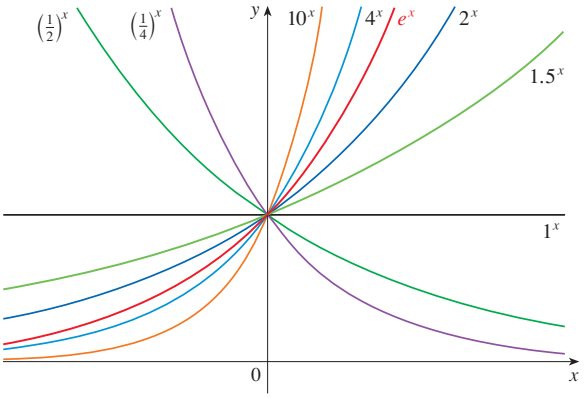
Cancellation Equations

$\log_b(b^x) = x \qquad b^{\log_b x} = x$

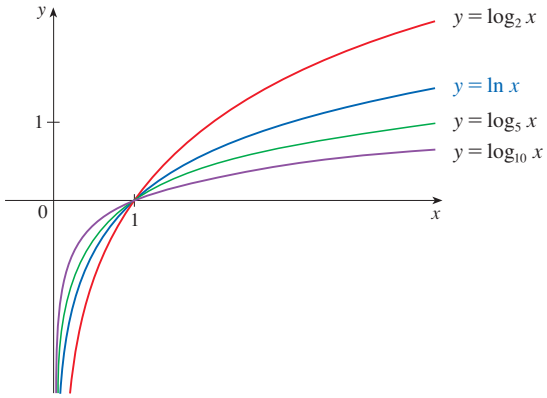
$\ln(e^x) = x \qquad e^{\ln x} = x$

Laws of Logarithms

1. $\log_b(xy) = \log_b x + \log_b y$
2. $\log_b\left(\frac{x}{y}\right) = \log_b x - \log_b y$
3. $\log_b(x^r) = r \log_b x$



Exponential functions



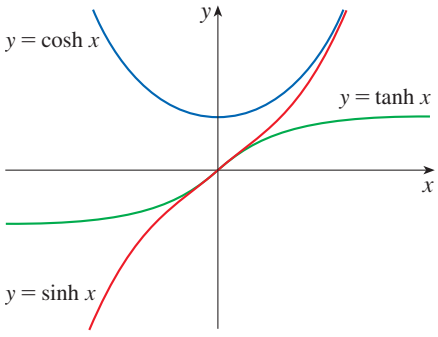
Logarithmic functions

Hyperbolic Functions

$\sinh x = \frac{e^x - e^{-x}}{2}$ $\qquad$ $\operatorname{csch} x = \frac{1}{\sinh x}$

$\cosh x = \frac{e^x + e^{-x}}{2}$ $\qquad$ $\operatorname{sech} x = \frac{1}{\cosh x}$

$\tanh x = \frac{\sinh x}{\cosh x}$ $\qquad$ $\coth x = \frac{\cosh x}{\sinh x}$



Inverse Hyperbolic Functions

$y = \sinh^{-1} x \iff \sinh y = x$ $\qquad$ $\sinh^{-1} x = \ln\left(x + \sqrt{x^2 + 1}\right)$

$y = \cosh^{-1} x \iff \cosh y = x \quad \text{and} \quad y \geqslant 0$ $\qquad$ $\cosh^{-1} x = \ln\left(x + \sqrt{x^2 - 1}\right)$

$y = \tanh^{-1} x \iff \tanh y = x$ $\qquad$ $\tanh^{-1} x = \frac{1}{2} \ln\left(\frac{1 + x}{1 - x}\right)$