

Logarithmic Functions

Defn

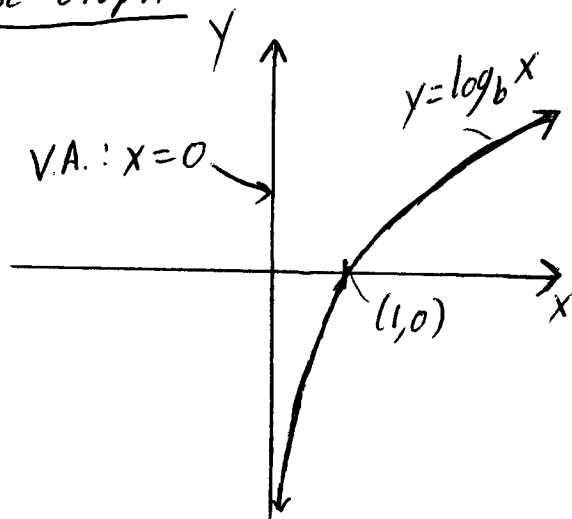
The logarithm base b of x equals y , written $\log_b x = y$, is equivalent to expression $x = b^y$.
(i.e. $\log_b x = y \Leftrightarrow x = b^y$)

Notes: 1) Domain: $x > 0$

2) Range: All real numbers

3) $\log_b x$ has a vertical asymptote at $x = 0$.

Base Graph



Rules

- 1) $\log_b 1 = 0$
- 2) $\log_b b = 1$
- 3) $\log_b b^x = x$
- 4) $b^{\log_b x} = x$
- 5) $\log_b (x \cdot y) = \log_b x + \log_b y$
- 6) $\log_b \left(\frac{x}{y}\right) = \log_b x - \log_b y$
- 7) $\log_b x^y = y \log_b x$
- 8) $\log_b x = \frac{\log_c x}{\log_c b}$ (Change of Base Formula)

Notation: 1) $\log x := \log_{10} x$

2) $\ln x := \log_e x$

Remark: Logarithms will be used in Calculus I to solve exponential growth/decay problem & to differentiate 'complicated' functions.