

Properties of Logarithms

LOGARITHMS ARE EXPONENTS

A logarithm is defined as the following:

For $x > 0$ and $b > 0, b \neq 1$

$$b^y = x \text{ iff } y = \log_b x$$

Remember, you may NOT take the log of a negative number (or 0). The domain of a log is ONLY defined for POSITIVE numbers (meaning NOT for 0).

Logarithms with base b	Natural Logs (logs with base e)
For $x > 0$ and $0 < b \neq 1$ $y = \log_b x \text{ iff } b^y = x$	For $x > 0$ $\log_e x = \ln x$
$\log_b 1 = 0$	$\ln 1 = 0$
$\log_b b = 1$	$\ln e = 1$
$\log_b b^x = x \log_b b = x$	$\ln e^x = x \ln e = x$
$\log_b (uv) = \log_b u + \log_b v$	$\ln(xy) = \ln x + \ln y$
$\log_b \left(\frac{u}{v}\right) = \log_b u - \log_b v$	$\ln \frac{x}{y} = \ln x - \ln y$
$\log_b (x^y) = y \log_b x$	$\ln(x^y) = y \ln x$
For $b \neq 1$ and $y \neq 1$: $\log_b x = \frac{\log_y x}{\log_y b}$	