

PROPERTIES of LOGARITHMS

common logarithm $\log x = \log_{10} x$ for all positive numbers x

natural logarithm $\ln x = \log_e x$ for all positive numbers x

Fundamental Equivalence between Logarithms and Exponentials: for all positive numbers a , where $a \neq 1$. $a^k = x$ is equivalent to $k = \log_a x$		ex: $2 = \log_{10} x$ $10^2 = x$
one-to-one property of logarithms	$\log_a u = \log_a v$ for all positive numbers x, y & $b > 0$ and $b \neq 1$	ex: $\log_5 x = \log_5 3$ $x = 3$
product rule	$\log_a uv = \log_a u + \log_a v$	ex: $\log 5x = \log 5 + \log x$
quotient rule	$\log_a \frac{u}{v} = \log_a u - \log_a v$	ex: $\ln \frac{x}{3} = \ln x - \ln 3$
power rule	$r \log_a u = \log_a u^r$	ex: $\log_2 5^x = x \log_2 5$
log of a base to a power	$\log_a a^x = x$	ex: $\log_5 5^3 = 3$ $\ln e = 1$
base to a log with the same base	$a^{\log_a x} = x$	ex: $10^{\log 4} = 4$
change-of-base rule	$\log_b n = \frac{\log n}{\log b}$	ex: $\log_4 7 = \frac{\log 7}{\log 4}$