Log Rules

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Logarithms and Exponents

Definition of a Logarithm

Exponent

$\log_b(x) = y$ ⇔ (is equivalent to) $b^y = x$ ⇔ " log base b of x equals y (the exponent)"

BASE

equals

$\log_b(x) = y$ ⇔ "b to the y = x" ⇔ $b^y = x$

to the

$\log_2(4) = y$ ⇔ $2^y = 4$ ⇔ $2^y = 2^2$ ∴ (therefore) $y = 2$

Common Log
$\log(x) = \log_{10}(x)$

Natural Log
$\log_e(x) = \ln(x)$

e=2.7182818…

Inverse Rules

$10^{\log_{10}(x)} = x$ **	$e^{\ln(x)} = x$	$\ln(e) = 1$
$\log_{10} 10^x = x$	$\ln(e^x) = x$	$\log 10 = 1$
$\log_b b^x = x$		$\log_b b = 1$

Other Facts

$\log_b(0) = undefined$	$\log_b(1) = 0$	Domain of $\log_b(x)$ is $x > 1$

Properties

Product Rule	$\log x + \log y = \log(x \cdot y)$	⇔	$\log(x \cdot y) = \log x + \log y$
Quotient Rule	$\log x - \log y = \log\left(\frac{x}{y}\right)$	⇔	$\log\left(\frac{x}{y}\right) = \log x - \log y$
Power Rule	$p \log_b x = \log_b x^p$	⇔	$\log_b x^p = p \log_b x$
Change of Base Rule	$\log_b x = \frac{\ln(x)}{\ln(b)}$	or	$\log_b x = \frac{\log(x)}{\log(b)}$

**$\log(x^2)=25$
$10^{\log(x^2)}=10^{25}$
$X^2=10^{25}$