

Logarithms

Definition:

Logarithmic Form

Exponential Form

$$\log_b x = y$$

is equivalent to

$$b^y = x$$

Many logarithmic problems can be solved by switching from one form to the other.

Logarithmic

Exponential

Product Rule:

$$\log_a uv = \log_a u + \log_a v$$

$$a^x \cdot a^y = a^{x+y}$$

Quotient Rule:

$$\log_a \left(\frac{u}{v}\right) = \log_a u - \log_a v$$

$$\frac{a^x}{a^y} = a^{x-y}$$

Power Rule:

$$\log_a u^n = n \log_a u$$

$$(a^x)^y = a^{xy}$$

More Definitions:

common log:

$$\log x = \log_{10} x$$

natural log:

$$\ln x = \log_e x$$

Miscellaneous:

Logarithmic

Exponential

$$\log_b b = 1$$

$$b^1 = b$$

$$\log_b 1 = 0$$

$$b^0 = 1$$

$$\text{If } \log_b u = \log_b v \text{ then } u=v$$

$$\text{If } b^x = b^y \text{ then } x=y$$

Special Properties:

$$b^{\log_b x} = x$$

and

$$\log_b b^x = x$$

Change of Base: $\log_a b = \frac{\log_c b}{\log_c a}$