Logarithmic Rules

Logarithm Definition: $\log_b a = m \Leftrightarrow b^m = a$ $\qquad$ $\log_4 16 = 2 \quad 4^2 = 16$

Common Logarithm: $\log_{10} = \log$

Natural Logarithm: $\log_e = \ln$

Change of Base: $\log_b a = \dfrac{\log a}{\log b} = \dfrac{\ln a}{\ln b}$ $\qquad$ $\log_5 13 = \dfrac{\log 13}{\log 5}$

Product Rule: $\log_b (xy) = \log_b x + \log_b y$ $\qquad$ $\log_3 (4x) = \log_3 4 + \log_3 x$

Quotient Rule: $\log_b \dfrac{M}{N} = \log_b M - \log_b N$ $\qquad$ $\log_5 \dfrac{x}{y} = \log_5 x - \log_5 y$

Power Rule: $p \log_b M = \log_b M^p$ $\qquad$ $4 \log_5 x = \log_5 x^4$

Same Base $\log_b b^x = x$ $\qquad$ $\log_3 3^2 = 2$

$b^{\log_b x}$ $\qquad$ $7^{\log_7 2} = 2$

Logarithmic Equality $\log_b x = \log_b y \Leftrightarrow x = y$ $\qquad$ If $\log_3 4 = \log_3 y$
Then $4 = y$