Basic Algebra Rules

Exponential Rules:

\[ a^m \cdot a^n = a^{m+n} \quad \quad (ab)^m = a^m b^m \quad \quad \frac{a^m}{a^n} = a^{m-n}; \quad a \neq 0 \]

\[ a^0 = 1; \quad a \neq 0 \quad \quad a^{1/m} = \sqrt[m]{a} \quad \quad \left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}; \quad b \neq 0 \]

\[ (a^m)^n = a^{mn} \]

Distribution Law:

\[ a(b + c) = ab + ac \quad \quad \frac{a + b}{c} = \frac{a}{c} + \frac{b}{c} \quad \quad \frac{a - b}{c} = \frac{a}{c} - \frac{b}{c} \]

Quadratic Factoring:

\[ (a + b)^2 = a^2 + 2ab + b^2 \quad \quad (a - b)^2 = a^2 - 2ab + b^2 \]

\[ a^2 - b^2 = (a - b)(a + b) \]

Properties of Logarithm:

\[ \log_a (MN) = \log_a M + \log_a N \quad \quad \log_a \left(\frac{M}{N}\right) = \log_a M - \log_a N \quad \quad \log_a (M)^t = t \log_a M \]

\[ \log_a a = 1 \quad \quad \log_a 1 = 0 \]

\[ \log_a a^x = x \quad \quad a^{\log_a x} = x \]

Change of Base: \[ \log_a M = \frac{\log_b M}{\log_b a} \]

\[ \ln(MN) = \ln M + \ln N \quad \quad \ln \left(\frac{M}{N}\right) = \ln M - \ln N \quad \quad \ln(M)^t = t \ln M \]

\[ \ln e = 1 \quad \quad \ln 1 = 0 \]

\[ \ln e^x = x \quad \quad e^{\ln x} = x \]