Exponent and logarithm rules, taken from

Exponents

$$x^m \cdot x^n = x^{m+n}$$

$$\frac{x^m}{x^n} = x^{m-n}$$

$$\left(x^m\right)^n = x^{mn}$$

$$\left(xy\right)^n = x^n y^n$$

$$\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$$

$$x^0 = 1 \quad (x \neq 0)$$

$$x^{-n} = \frac{1}{x^n}$$

$$\frac{x^{-n}}{y^{-m}} = \frac{y^m}{x^n}$$

$$\sqrt[n]{a^m} = a^{m/n}$$

Ex: $\quad x^{-\frac{5}{3}} = \dfrac{1}{\sqrt[3]{x^5}}$

Logarithms

$$y = \log_b x \quad \text{if and only if} \quad x = b^y$$

$$\log_b 1 = 0$$

$$\log_b b = 1$$

$$\log_b b^x = x$$

$$b^{\log_b x} = x, \quad x > 0$$

In particular:

$\ln 1 = 0$

$\ln e = 1$

$\ln e^x = x$

$e^{\ln x} = x$

$$\log_b (xy) = \log_b x + \log_b y$$

$$\log_b \left(\frac{x}{y}\right) = \log_b x - \log_b y$$

$$\log_b x^n = n \log_b x$$

Ex: $\ln\left(\dfrac{x^2}{\sin x}\right) = \ln x^2 - \ln(\sin x)$

$\qquad\qquad\quad = 2\ln x - \ln(\sin x)$

$$\log(xy) \neq \log x \cdot \log y$$

caution

$$\log\left(\frac{x}{y}\right) \neq \frac{\log x}{\log y}$$