Exponent and logarithm rules, taken from

Exponents

$$x^m \cdot x^n = x^{m+n}$$
$$\frac{x^m}{x^n} = x^{m-n}$$
$$(x^m)^n = x^{m \cdot n}$$
$$(xy)^n = x^n y^n$$
$$\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$$

$$x^0 = 1 \quad (x \neq 0)$$
$$x^{-n} = \frac{1}{x^n}$$
$$\frac{x^{-n}}{y^{-m}} = \frac{y^m}{x^n}$$
$$\sqrt[n]{a^m} = a^{m/n}$$

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

Logarithms

$y = \log_b x$ *if and only if* $x = b^y$

$$\log_b 1 = 0$$
$$\log_b b = 1$$

In particular: $\ln 1 = 0$, $\ln e = 1$, $\ln e^x = x$, $e^{\ln x} = x$

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

$$\log_b (xy) = \log_b x + \log_b y$$
$$\log_b \left(\frac{x}{y}\right) = \log_b x - \log_b y$$
$$\log_b x^n = n \log_b x$$

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

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

caution

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