Rules of Logs:

$$\log_a x = b \quad \leftrightarrow \quad a^b = x$$

$$\ln x = b \quad \leftrightarrow \quad e^b = x$$

$$\log_e x = \ln x$$

$$a^{\log_a x} = x$$

$$e^{\ln x} = x$$

$$\log_a a = 1$$

$$\ln e = 1$$

$$\log_a 1 = 0$$

$$\ln 1 = 0$$

$$\log_a x^m = m \log_a x$$

$$\log_a xy = \log_a x + \log_a y$$

$$\log_a \frac{x}{y} = \log_a x - \log_a y$$

$$\log_a x = \frac{\log x}{\log a} = \frac{\ln x}{\ln a}$$

Domain of $\log x$ and $\ln x$: $(0, \infty)$

Rules of Exponents:

$$x^a . x^b = x^{a+b}$$

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

$$(x^a)^b = x^{ab}$$

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

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

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

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