Section 5.3: Properties of logs

Change of Base Formula

common log → base 10

natural log (ln) → base e

$$\log_a(x) = \frac{\log_b(x)}{\log_b(a)}$$ → b = new base

$$\log_2(32) = \frac{\log(32)}{\log(2)} = \frac{1.505}{0.301} = 5$$

$$\log_2(32) = \frac{\ln(32)}{\ln(2)} = \frac{3.4657}{0.6931} = 5$$

Properties of Logs

Exponent Rules →

$$\begin{cases} x^m \cdot x^n = x^{m+n} \\ x^m / x^n = x^{m-n} \\ (x^m)^n = x^{mn} \end{cases}$$

- $\log_a(uv) \rightleftharpoons \log_a(u) + \log_a(v)$
- $\log_a\left(\frac{u}{v}\right) = \log_a(u) - \log_a(v)$
- $\log_a(x)^u = u\log_a(x)$

ex: $\log\left(\frac{xy}{2z}\right) = \log(x\cancel{z}) - \log(2z)$

$\log(x) + \log(y) - [\log(2) + \log(z)]$

$\log(x) + \log(y) - \log(2) - \log(z)$

- $\ln(uv) = \ln(u) + \ln(v)$
- $\ln\left(\frac{u}{v}\right) = \ln(u) - \ln(v)$
- $\ln(x^u) = u\ln(x)$

ex: $\ln(x) + \ln(y) - \frac{1}{2}\ln(z)$

$\ln(xy) - \ln(z^{\frac{1}{2}})$

$\ln\left(\frac{xy}{\sqrt{z}}\right)$