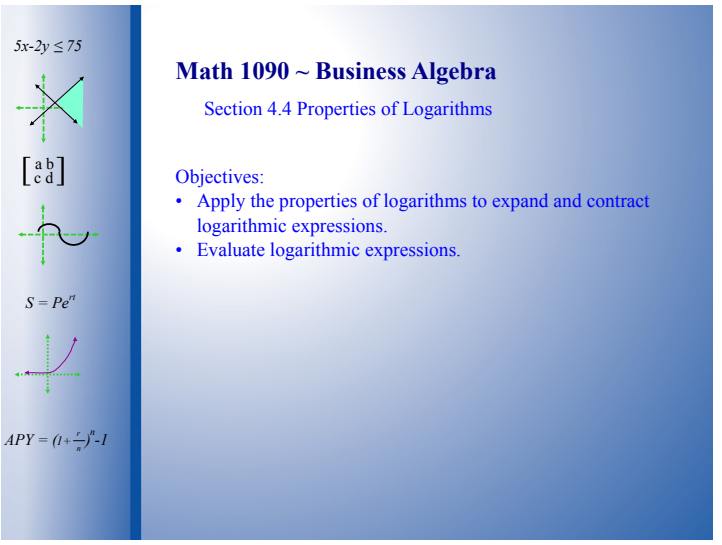

Properties of Logarithms

$$\log_a a^x = x$$
$$\log_a a = 1$$
$$\log_a 1 = 0$$
$$a^{\log_a x} = x$$
$$\log_a (mn) = \log_a m + \log_a n$$
$$\log_a \left(\frac{m}{n}\right) = \log_a m - \log_a n$$
$$\log_a m^n = n \log_a m$$

Proof

Ex 1: Use log properties to expand.

a) $\ln\frac{x^2}{x+1}$ b) $\log_3(x^3\sqrt{x-2})$

c) $\log\left(\frac{y^4}{(y-2)^6}\right)$

Ex 2: Use log properties to condense.

a) $\log_4 8-\frac{1}{2}\log_4 5+\log_4 3$ b) $2(\ln x-\ln(x+5))$

c) $\log(2x+1)-\frac{1}{3}\log(x-1)$

Ex 3: Evaluate (without a calculator).

a) $\log_7 49+\log_5 125-\log_2 64$

b) $\log_4\left(\frac{1}{64}\right)+\ln(e^7)-\log_5 1$

Ex 4: If $\log_b x=1.2,\quad \log_b y=3.1,\quad \log_b z=11.1,$

evaluate $\log_b\left(\frac{x}{y}\right)-\log_b(z^2x)$.

Ex 5: Evaluate these expressions.

a) $e^{2\ln 5}$

b) $\log_4 4^a$

c) $\ln e^5$

d) $9^{\log_9(11)+\log_9(2)}$