

$$5x - 2y \leq 75$$



$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$$



$$S = Pe^{rt}$$



$$APY = \left(1 + \frac{r}{n}\right)^n - 1$$

Math 1090 ~ Business Algebra

Section 4.4 Properties of Logarithms

Objectives:

- Apply the properties of logarithms to expand and contract logarithmic expressions.
- Evaluate logarithmic expressions.

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 $\log_b x = 1.2$, $\log_b y = 3.1$, $\log_b z = 11.1$,

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