

# MHF 4UI UNIT 4 Exponential and Logarithmic Functions

Day 4 - Laws of Logarithms

Product Law:  $\log_a(pq) = \log_a p + \log_a q$

Power Law:  $\log_a(p^c) = c(\log_a p)$

Quotient Law:  $\log_a \frac{p}{q} = \log_a p - \log_a q$

Example 1: Express each of the following as a single logarithm.

a)  $\log_4 8 - \log_4 10 + \log_4 3$       b)  $\frac{1}{2} \log_{10} 7 - \log_{10} 5$

c)  $\log(x+y) - \log(x-y)$

d)  $\log_3 ab + \log_3 bc$

Example 2: Rewrite each of the following with no products, quotients or powers:

a)  $\log_2(m^3n^2)$

b)  $\log_9 \sqrt[3]{y^2 + y}$

Example 3: Evaluate each of the following:

a)  $\log_2 72 - \log_2 9$

b)  $\log_{12} 9 + \log_{12} 16$

c)  $\log_2 8^{27}$

Change of Base Formula:

$$\log_b x = \frac{\log_a x}{\log_a b}$$

Example 4: Evaluate:

a)  $\log_2 13$

b)  $\log_8 4$