

7.4 PROPERTIES OF LOGARITHMS

FOR ANY POSITIVE NUMBERS M, N , b
 $b \neq 1$

① PRODUCT PROPERTY: $\log_b MN = \log_b M + \log_b N$

② QUOTIENT PROPERTY: $\log_b \frac{M}{N} = \log_b M - \log_b N$

③ POWER PROPERTY: $\log_b M^x = x \log_b M$

NOTE: THESE ARE SIMILAR TO THE RULES
OF EXPONENTS

$$x^m \cdot x^n = x^{m+n}$$

$$\frac{x^m}{x^n} = x^{m-n}$$

EX: $\log_4 10 = \log_4 2 + \log_4 5$

$$\log_4 64 = \log_4 (4 \cdot 16) = \log_4 4 + \log_4 16$$

$$3 = 1 + 2$$

EX: WRITE AS A SINGLE LOGARITHM

$$\log_4 X - 2 \log_4 Y + 3 \log_4 (2X)$$

$$= \log_4 X - \log_4 Y^2 + \log_4 8X^3$$

$$= \log_4 \frac{X}{Y^2} + \log_4 8X^3 = \log_4 \frac{8X^4}{Y^2}$$

EX: EXPAND $\log \frac{2X^3Y}{5Z}$

$$= \log 2X^3Y - \log 5Z$$

$$= \log 2 + \log X^3 + \log Y - (\log 5 + \log Z)$$

$$= \log 2 + 3 \log X + \log Y - \log 5 - \log Z.$$

EX: EVALUATE $\log_6 4 + \log_6 9$

$$= \log_6 36 = 2$$

EX: IF $\log 4 \approx .602$ AND $\log 5 \approx .699$,
FIND $\log 0.8$

$$\log 0.8 = \log \frac{4}{5} = \log 4 - \log 5 \approx .602 - .699 = -0.097$$