

Name: _____ Date: _____ Period: _____

7-4 Properties of Logarithms

Standards

A2. A.SSE.B.2 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Use the properties of exponents to rewrite expressions for exponential functions.

A2. F.LE.A.1 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or input-output pairs.

A2. F.LE.B.3 Interpret the parameters in a linear or exponential function in terms of a context.

A2.F.IF.B.5 Compare properties of two functions each represented in a different way

A2. F.IF.A.2 Calculate and interpret the average rate of change of a function (presented symbolically)

Estimate the rate of change from a graph.

Key Concepts

Properties of Logarithms

Product Property: $\log_b MN = \log_b M + \log_b N$

Quotient Property: $\log_b \frac{M}{N} = \log_b M - \log_b N$

Power Property: $\log_b M^n = n \log_b M$

Change of Base Formula: $\log_b M = \frac{\log_c M}{\log_c b}$

Examples

1. (I do) Write each logarithmic expression as a single logarithm.

a. $\log_4 5x + \log_4 3x$

b. $6\log_5 x + \log_5 y$

c. $\log_4 64 - \log_4 16 + \log_4 4$

2. (I do) Expand each logarithm.

a. $\log_7 \left(\frac{x}{y}\right)$

b. $\log(4p^3)$

c. $\log_9 \frac{x^4}{729}$

3. (We do) Use the Change of Base Formula to evaluate $\log_6 12$.

4. (They do) Determine if each statement is true or false.

a. $\log_2 4 + \log_2 8 = 5$

b. $\log(x - 2) = \frac{\log x}{\log 2}$

5. (They do) The pH of a substance equals $-\log [H^+]$, where $[H^+]$ is the concentration of hydrogen ions. $[H^+]$ for household ammonia is 10^{-11} . $[H^+]$ for vinegar is 6.3×10^{-3} . What is the difference of the pH levels of ammonia and vinegar?

(You do) Practice 7-4: Complete your assignment on a separate sheet of paper. Show all work.

1. Write each expression as a single logarithm.

a. $\log_4 2 + \log_4 8$

b. $\log 8 - 2 \log 6 + \log 3$

c. $\log_7 x + \log_7 y - 2 \log_7 z$

2. Expand each logarithm.

a. $\log_5 x^2 y^3$

b. $\log_2 \sqrt{x}$

c. $\log_5 \frac{25}{x}$

d. $\log 10m^4 n^{-2}$

3. Determine whether the statement is true or false.

a. $\log_4 7 - \log_4 3 = \log_4 4$

b. $\log_3 \frac{3}{2} = \frac{1}{2} \log_3 3$

4. The pH of a substance equals $-\log [H^+]$, where $[H^+]$ is the concentration of hydrogen ions. $[H^+]$ for dish detergent is 10^{-12} . What is the pH level of dish detergent?