6-1: Properties of Logarithms

6-1a: I can use the properties of exponents to simplify and evaluate logarithms.

6-1b: I can use the properties of logarithms to simplify and evaluate logarithms.

EXPONENT RULES

Graphic Organizer

Name	Rule	Examples
ADDING & SUBTRACTING MONOMIALS	**COMBINE LIKE TERMS!!!** (DO NOT CHANGE common variables and exponents!)	**1.** $9x^2y - 10x^2y =$ **2.** Subtract $6w$ from $8w$.
PRODUCT RULE	$x^a \cdot x^b =$	**1.** $h^2 \cdot h^6 =$ **2.** $(-2a^2b)\cdot(7a^3b) =$
POWER RULE	$(x^a)^b =$	**1.** $(x^2)^3 =$ **2.** $(-2m^5)^2 \cdot m^3 =$
QUOTIENT RULE	$\frac{x^a}{x^b} =$	**1.** $\frac{27x^5}{42x} =$ **2.** $\frac{(y^2)^2}{y^4} =$
NEGATIVE EXPONENT RULE	$x^{-a} =$	**1.** $-5x^{-2} =$ **2.** $\frac{4k^2}{8k^5} =$
ZERO EXPONENT RULE	$x^0 =$	**1.** $7x^0 =$ **2.** $\frac{(w^4)^2}{w^8} =$

5-2 Rules of Logarithms

Name	Property	Examples
Zero Rule	$\log_a 1 =$	$\log_5 1 =$ $\ln 1 =$
Identity Rule	$\log_a a =$	$\log_4 4 =$ $\log 10 =$
Inverse Properties	$\log_a a^r =$ $b^{\log_b M} =$	$\log_4 4^3 =$ $\ln e^{-0.5} =$ $5^{\log_5 20} =$ $e^{\ln 24} =$
Product Rule	$\log_b MN =$	$\log_2 5 * 3 =$ $\log 5w =$ $\ln 6z =$
Quotient Rule	$\log_b \frac{M}{N} =$	$\log_7 \frac{9}{x} =$ $\ln \frac{p}{3} =$
Power Rule	$\log_b M^r =$	$\log_8 3^5 =$ $\log_b 5 =$

Find the value of each logarithm without using a calculator.

1. $\log_7 7$

2. $\log_{18} 18$

3. $\log_5 1$

4. $\log_9 1$

$$\log_a 1 = 0 \qquad \log_a a = 1$$

$\log_5 1$ $\qquad$ $\ln 1$

$\log_4 4$ $\qquad$ $\log 10$

$\log_3 3^2$

$\log_5 5^8$

Without evaluating, predict what the following logs equal:

$\log_2 2^{10}$

$\log_{20} 20^7$

[redacted]

$$\log_a a^r = r$$

$\log_4 4^3$ $\ln e^{-0.5}$

Recall: $b^x = a \quad \Leftrightarrow \quad \log_b a = x$

$$5^{\log_5 20}$$

[redacted]

$\log_{20} 20^7$

$$b^{\log_b M} = M$$

$5^{\log_5 20}$

$8^{\log_8 \sqrt{23}}$

$12^{\log_{12} \sqrt{2}}$

$10^{\log 0.2}$

[redacted]

$$\log_b(MN) = \log_b M + \log_b N$$

[redacted]

[redacted]

$\log_2(5 \cdot 3)$ $\ln(6z)$

Find 3 ways to expand $\log_3 24$ using this rule

$$\log_b \frac{M}{N} =$$

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[redacted]

$$\log_b\left(\frac{M}{N}\right) = \log_b M - \log_b N$$

$\log_2\left(\frac{5}{3}\right)$

$\log\left(\frac{y}{5}\right)$

Find 3 ways to expand $\log_5 3$
using this rule

$$\log_3\left(\frac{4x}{y}\right)$$

$$\log_3\left(\frac{3m}{n}\right)$$

$$\log_3\left(\frac{q}{3p}\right)$$

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$$\log_2(4)^3 = 3 \cdot \log_2 4$$

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$$\log_b M^r = r\log_b M$$

$\log_8 3^5$

$\ln x^{\sqrt{3}}$

$\log_5 25$

$\log b^5$

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$\log_2(x^2y^3)$

$\log_6 \frac{x^2}{y^3}$

$$\log_a 1 = 0 \qquad \log_a a = 1$$

[redacted]

$$\log_b M^r = r \log_b M$$

[redacted]

$$\log_a a^r = r$$

[redacted]

$$\log_b \left(\frac{M}{N}\right) = \log_b M - \log_b N$$

[redacted]

$\log_{20} 20^7$

$$b^{\log_b M} = M$$

[redacted]

$$\log_b (MN) = \log_b M + \log_b N$$

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Day 2

$$\log_5\left(a^{-2}bc^3\right)^{-2}$$

$$\log\left(a^2\sqrt{bc}\right)$$

$$\log\left(\frac{100x}{\sqrt{y}}\right)$$

$$\log_6 3 + \log_6 12$$

$$\log(x-2) - \log x$$

$$\log_5 x - 3\log_5 2$$

$$\log(x-1) + \log(x+1) - 3\log x$$