## 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

EXPONEIAL KOLES		Graphic Unganizer
Name	Rule	Examples
ADDING & SUBTRACTING MONOMIALS	(DO NOT CHANGE common variables and exponents!)	<b>1.</b> $9x^2y - 10x^2y =$ <b>2.</b> 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	$x^{-a} =$	<b>1.</b> $-5x^{-2} =$ <b>2.</b> $\frac{4k^2}{8k^5} =$
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 <sub>5</sub> 1 =
Identity Rule	$\log_a a =$	log <sub>4</sub> 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<sub>9</sub>1

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

 $\log_5 1$ 

ln1

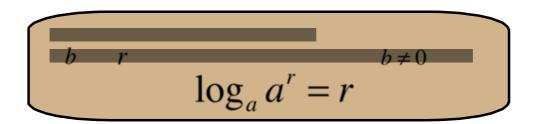
 $log_4 4$ 

log 10

- $\log_3 3^2$   $\log_5 5^8$

Without evaluating, predict what the following logs equal:

- $\log_2 2^{10}$
- $\log_{20} 20^7$

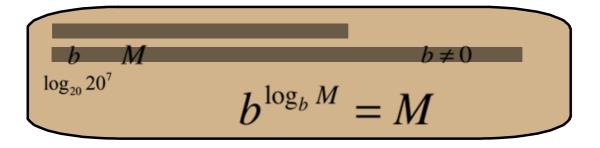


$$\log_4 4^3$$

 $\ln e^{-0.5}$ 

Recall: 
$$b^x = a \iff \log_b a = x$$

$$5^{\log_5 20}$$



$$5^{\log_5 20}$$

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

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

$$10^{\log 0.2}$$

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

$$\log_2(5\cdot 3)$$

ln(6z)

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

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

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

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

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

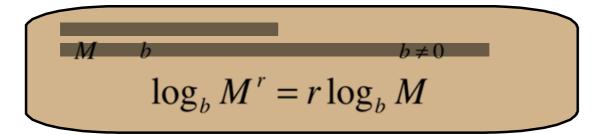
$$\log_3\!\!\left(\frac{4x}{y}\right)$$

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

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

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

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



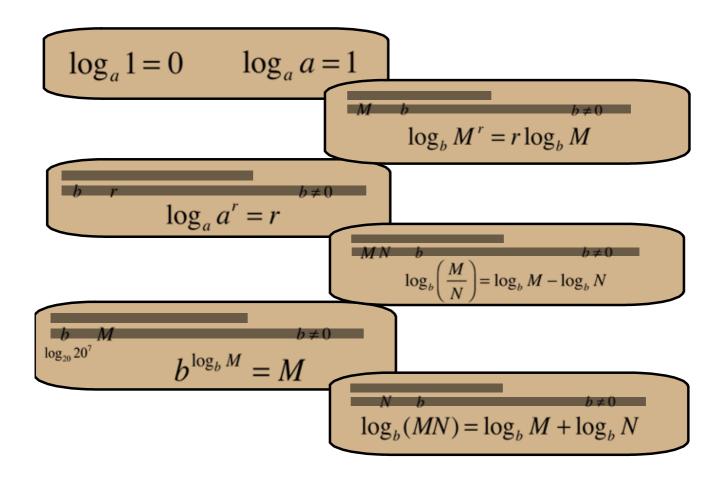
 $\log_8 3^5$ 

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

 $log_5 25$ 

 $\log b^5$ 

$$\log_2(x^2y^3) \qquad \qquad \log_6\frac{x^2}{y^3}$$



Day 2

$$\log_5 \left( a^{-2} b c^3 \right)^{-2} \qquad \log \left( a^2 \sqrt{bc} \right) \qquad \log \left( \frac{100 x}{\sqrt{y}} \right)$$

$$\log_6 3 + \log_6 12$$

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

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

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