Lesson 8-4 Properties of Logarithms Mrs. Snow, Instructor

Last section we saw that $pH = -log \ [H+]$ can also be expressed in exponential form: $10^{-pH} = [H^+]$. Since logarithms are inverses of exponents, you can derive the properties of logarithms from the properties of exponents:

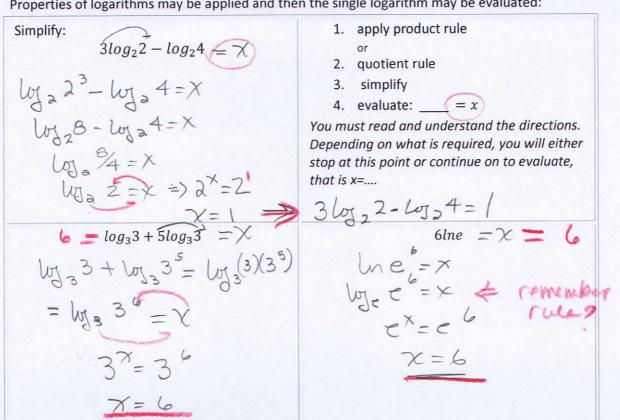
Operation	Logarithms NEW	Example
product	$log_b(m \cdot n) = log_b m + log_b n$	log 3 8 · 4 = log 3 8 + log
quotient	$\log_b m / n = \log_b m - \log_b n$	ly 3/1 = log 9 - ly 11
power	$log_b m^x = x log_b m$	loga x7 = 7loga x

Example: express as a single logarithm

log7 + log2	$log_212-log_23$
log (7.2) = log 14	Wg 2 3 = log 2 4
$log_3 8 - 2log_3 6 + log_3 3$	ln5 - xln2
ly 38-ly 362+ly 33=	ln 5 - ln ax =
$= \log_3 \frac{8}{36} + \log_3 3 = \log_3 \frac{8}{36} = \log_3 \frac{2}{3}$	$\int \frac{s}{a^{\times}}$
ly 8 2 (3) = log 3/3	

We can write as single logarithms and we can expand into multiple logarithms: $log_8x^3y^5 = log_8x^2$ $log_8x^3 + log_8y^5 = log_8x^2$ $log_8x^3 + log_8y^5 = log_8x^2$ $log_8x^2 + log_8x^2$ log_8

Properties of logarithms may be applied and then the single logarithm may be evaluated:



- 1. apply product rule
- 2. quotient rule
- 3. simplify
- 4. evaluate: $\underline{\hspace{1cm}} = x$

You must read and understand the directions.

$$3\log_{2}2-\log_{3}4=1$$

$$6lne = x = 6$$

$$lne = x$$

$$log_{e} = x + community$$

$$e^{x} = 6$$

$$x = 6$$

$$x = 6$$

Logarithms are uses to model sound. The intensity of a sound is the measure of the energy carried by the sound wave. The greater the intensity of a sound, the louder it seems. Loudness is measured in decibels with the formula: $L=10lograc{I}{I_0}$. (I is the intensity of the sound in watts per square meter and Io is the lowest intensity sound that the average human can hear.)

Earplugs are advertised to block a certain amount of noise. One earplug brand claims to block the sound of noise as loud as 22 dB. A second brand claims to block 8 times that amount. If this claim is true, how many more decibels are blocked? (5.6)

First off this is a subtraction problem as we are looking at "how many more." So let L2= brand 2 loudness and

 L_1 = brand 1 loudness. Identify the relationship between the two brands: $I_2 = 8I_1$, so using our equation for loudness:

$$L_1 = Bnad_1$$
 $L_2 = Bnand_2$

$$L_1 = 10 \text{ log } \frac{\Gamma_1}{\Gamma_0}$$

$$L_2 = 10 \text{ log } \frac{\Gamma_2}{\Gamma_1} = 10 \text{ log } \frac{8\Gamma_1}{\Gamma_0}$$

I2 = (8 I)

$$L_{1} = 10 \text{ log} \frac{1}{10} = 10 \text{ log} \frac$$