Defining and Evaluating Logarithms Review

Objective: I can evaluate a logarithmic expression

How could we solve each of the following equations algebraically for x?

$x^2 = 9$ $3^x = 9$

What's the difference?

Jun 14-11:51 AM

Problems like $3^x = 9$

are why we have logarithms!

What does this problem mean? Estimate the value for x.

$5^x = 50$

$5^1 = 5$
$5^2 = 25$
$5^3 = 125$

Estimate the value for x.

$$3^x = 90$$

$$y^x = z$$

Logarithm Activity! Yay!

What does the following equation mean?

$$\log_4 16 = x$$

Evaluate the following logarithms.

$\log_2 8$ 3

$\log_2 32$ 5

$\log_2 \frac{1}{4}$ -2

$\log_3 81$ 4

$\log_7 243$ 3

$\log_4 \frac{1}{64}$ -3

Exponential Equation	Logarithmic Equation
$b^x = a$	$\log_b a = x$
$2^x = 16$	$\log_2 16 = x$

Switch between Log and exponential forms

Exponential Equation	Logarithmic Equation
$3^5 = 243$	$\log_3 243 = 5$
$4^{-3} = \frac{1}{64}$	$\log_4 \frac{1}{64} = -3$
$\left(\frac{3}{4}\right)^r = s$	
	$\log_{\frac{1}{5}} v = w$

base 10

$y = \log x$ _____ $x = 10^y$

e ≈ 2.7

$y = \ln x$ _____ $x = e^y$

ln = $\log_e$

Exponential Equation	Logarithmic Equation
$e^5 \approx 148.4$	$\ln 148.4 = 5$
$e^{1.8} \approx 6$	$\ln 6 \approx 1.8$
$10^5 = 100{,}000$	$\log 100{,}000 = 5$
$10^3 = 1000$	$\log 1{,}000 = 3$

1 x'

x

What about these?

$\log_5 25$ $\log_8 \frac{1}{64} = -2$

$\log_{25} 5$ $\log_8 2$ $\log_{125} 5$

$25^0 = 1$

$25^1 = 25$

$\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{3}$

Notice a pattern?

And these?

$\log_{\frac{1}{4}} 16$ $\log_{\frac{1}{2}} 8$ $\log_{\frac{1}{3}} 81$

Notice a pattern?

Evaluate the following logarithms.

$\log_{27} 3$ $\log_{\frac{1}{4}} 64$

$\log_{81} 9$ $\log_{\frac{1}{7}} 243$

Here are some fun ones!

$\log_{81} \frac{1}{9}$ $-\frac{1}{2}$

$\log_{16} \frac{1}{2}$ $-\frac{1}{4}$

$\log_{49} \frac{1}{7}$

$49^{\square} = \frac{1}{7}$ $-\frac{1}{2}$

Last ones.

$\log_0 3$ undefined

$\log_{16} -\frac{1}{2}$ und

$\log_{16} 0$ und

Why don't these work?

$\log_0 3$ $\log_{16} -\frac{1}{2}$ $\log_{16} 0$

cannot have base 0

no exponent gives neg #

no exponent gives a 0.