Lesson 8-3 part 2

Logarithms

Yesterday we looked at the inverse of exponentials, known as logarithms. Here we will look at a summary and brief review. An exponential equation and a logarithmic function are related to one another:

base argument

$$\boldsymbol{x = b^y \ therefore \ \log_b(x) = y.}$$

Regardless of what variables we use in this relationship, the two equations are equivalent. That is, it is not the variables that make up the relationship, but how they move.

What you need to remember is :

1. "b" is the base for each equation
2. The "x" and "y" switch sides
3. As in exponentials $b > 0$ so to in logs, $b > 0$, so **b is always positive.**

Fill in the following table to get a better understanding of the relationship between exponentials and logs

Converting from Exponential to Logarithmic Form

Exponential Equation	**Logarithmic Form**	**What we need to remember**
$\_\_^{6} = 64$	$log\_64 = 6$	The base of the exponent becomes the base of the logarithm
$4^{—} = 4$	$log_4 4 = \_\_$	The exponent is the logarithm
$5^{—} = 1$	$log_5 1 = \_\_$	Any nonzero base to the 0 power is 1
$5^{—} = 0.04$	$log_5 0.04 = \_\_$	An exponent (or log) can be negative.
$3^{—} = 81$	$log_3 81 = \_\_$	The log (and the exponent) can be a variable

Converting from Logarithmic Form to Exponential Form

Logarithmic Equation	**Exponential Form**	**What we need to remember**
$log_{10} 100 = 2$	$10^2 100 =$	The base of the logarithmic becomes the base of the power
$log_7 49 = \_\_$	$7^{—} = 49$	The logarithm is the exponent.
$log_8 0.0125 = \_\_$	$8^{—} = 0.0125$	A logarithm can be a negative number
$log_5 5 = \_\_\_$	$5^{—} = 5$	
$log_{12} 1 = \_\_\_$	$12^{–} = 1$	

Let's try some practice: **Write each exponential equation is logarithmic form:**

$9^2 = 81$	$3^3 = 27$	$x^0 = 1\ (x \neq 0)$

Now: **Write each logarithmic equation in exponential form:**

$log10_{10} = 1$	$log_{12}144$ =2	$log_{\frac{1}{2}}8 = -3$

When given a logarithmic equation to graph,

1. put into exponential form
2. find the inverse, f^{-1}
3. make an x-y table of equivalents
4. graph the exponential equation (remember this graph is the inverse)

$log_b x = y$ $\quad b^y = x$

inverse f^{-1} $\quad b^x = y$

x	-2	-1	0	1	2
y					

Since the log is the inverse of our exponential equation we derived , we now:

1. flip the **x** and **y** in our exponential table(remember, **x is y** and **y is x**): this gives us the table values for our log function
2. plot these points, the graph should be reflected over the line **y=x**

Table for the log graph

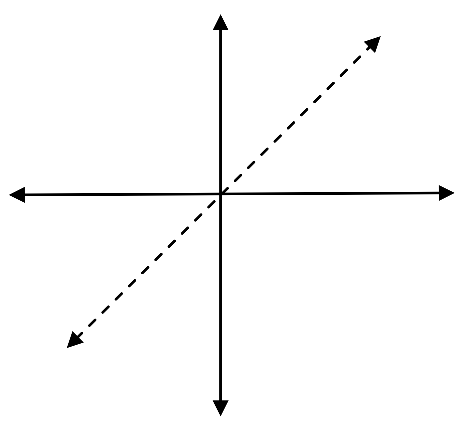
y	-2	-1	0	1	2
x					

Graph $y = log_3 x$

1. put into exponential form: $3^y = x$
2. find the inverse, f^{-1} ----$y = 3^x$
3. make an x-y table of equivalents -----

x	-2	-1	0	1	2
y	1/9	1/3	1	3	9

4. graph the exponential equation



For the log

1. flip the **x** and **y** in our exponential table(remember, **x is y** and **y is x**)
2. plot these points for the log, the graph should be reflected over the line **y=x**

f^{-1}(x)=y	-2	-1	0	1	2
x	1/9	1/3	1	3	9