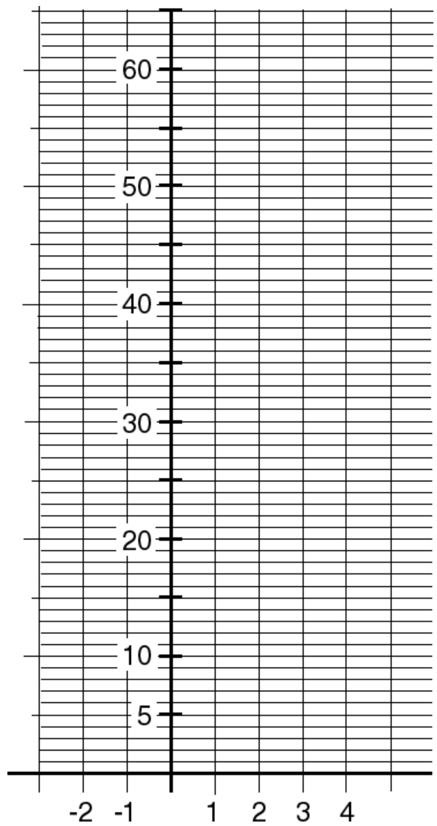
Visiting with exponential and logarithmic functions NAME:

We will explore the relationship between $y = a^x$ and $y = \log_a x$. We will also work on the basic rules of logarithms.

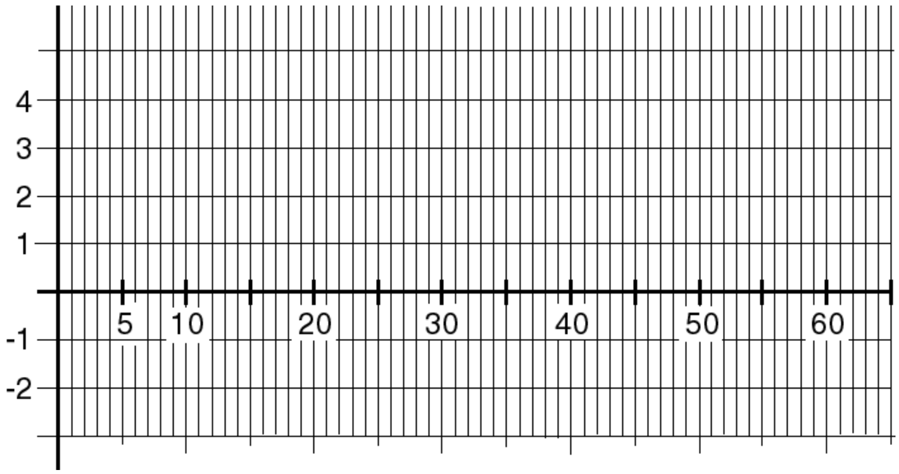
1. Complete the table and graph $y = 4^x$.

x	$y = 4^x$
-2	
-1	
0	
1	
2	
3	



2. The inverse of $y = 4^x$ is $y = \log_4 x$. Switch the *x* and *y* values in your table and plot those points to graph $y = \log_4 x$.

x	$y = \log_4 x$
	-2
	-1
	0
	1
	2
	3



3a.) In words, what is $\log_4 64$?

3b). What is the numerical value of $\log_4 64$?

3c.) How is this information (from questions 3a and 3b) shown on the graph of $y = \log_4 x$? On your graph, highlight the relevant point.
Complete the sentence: When *x* is _______, *y* is _______.

3d.) How is this information (from questions 3a and 3b) shown on the graph of $y = 4^x$? On your graph, highlight the relevant point.
Complete the sentence: When *x* is _______, *y* is _______.

It's a good idea to try to understand why the log rules are the way they are. You can think through many of them and so do not have to flat out memorize so much. We'll try to do that here.

4. In words, what is $\log_b 1$? What numerical value does $\log_b 1$ have to be, no matter what b is?

5. In words, what is $\log_b b$? What numerical value does $\log_b b$ have to be, no matter what b is?

6. In words, what is $\log_b b^k$? What numerical value does $\log_b b^k$ have to be, no matter what b is? (Hint: Think about $\log_3 3^2$. What would you raise 3 to, to get 3^2? Don't over think this one!)

7. Make up an example, substituting your own values in for the variables for each of the three logarithm rules below. Show written work that the equation is true. In other words, simplify both sides of your example. You probably want to use numbers that are easy to manage but not zero or one.

Log rule – Remember b must be positive, not equal to 1.	**Use your own values of *b, M,* and *N* to make up an example. Show that the equation is true.**
$\log_b(M * N) = \log_b(M) + \log_b(N)$	
$\log_b M^r = r * \log_b M$	
$\log_b\left(M/N\right) = \log_b(M) - \log_b(N)$	