Logarithms

1. Make a table for the function $f(x) = 2^x$. Use at least $-4, -3, -2, -1, 0, 1, 2, 3, 4$ for x values.

2. Graph that function on graph paper. Make sure that x and y are on the same scale. The scale will have to accommodate -2^4 through 2^4.

3. Now make another table representing the function $f^{-1}(x)$ by making a table just like the other one but with the two columns switched (so for example $f^{-1}(8) = 2$).

4. Graph f^{-1}. If all is correct, the graph of f^{-1} looks just like the graph of f reflected about the line $y = x$, like any inverse function.

5. The function f^{-1}, the inverse of the exponential function 2^x, is called a *logarithm* function. In particular it is called the *logarithm base 2*. We write it as $\log_2$. So for example we may write $\log_2(8) = 3$, which is another way of saying $2^3 = 8$. Often we omit the function parentheses and write it $\log_2 8 = 3$. Fill in the table of exponential equations and their equivalent logarithm versions. (The symbol $\Leftrightarrow$ means "is equivalent to.")

$2^3 = 8$	$\Leftrightarrow$	$\log_2 8 = 3$
$2^4 = 16$	$\Leftrightarrow$	
	$\Leftrightarrow$	$\log_2 \frac{1}{8} = -3$
$2^0 = 1$	$\Leftrightarrow$	
	$\Leftrightarrow$	$\log_2 2 = 1$

6. The above logarithms have a *base* of 2. This logarithm asks a question: What power of 2 yields the input to the function? For example, to find $\log_2 16$ we ask, what power of 2 yields 16? What is that number?

7. There are other logarithms with other bases. The *common logarithm* has a base of 10. Sometimes we write common logarithms without an explicit base: What is the value of $\log 1000 = \log_{10} 1000$?