Pre-Calculus Notes Name: _____

Section 3.2 – Logarithmic Functions

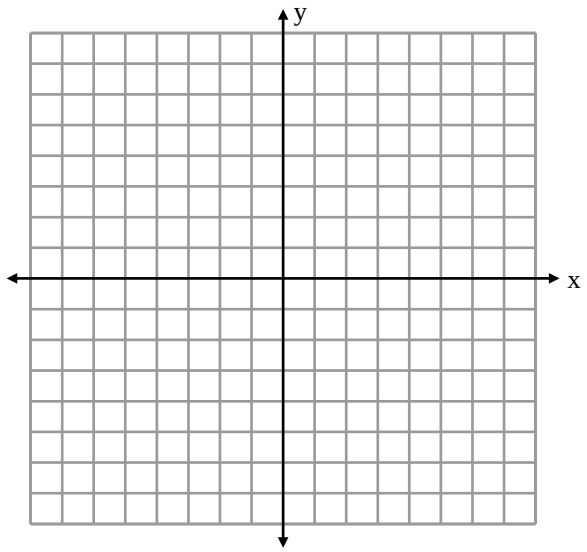
Since the exponential function $f(x) = b^x$ is one-to-one, it has an inverse function. The inverse function of an exponential function is called a logarithmic function.

MEMORIZE: If $x = b^y$, then $y = \log_b x$. **AND** If $y = \log_b x$, then $x = b^y$.

EXAMPLE 1: Graph the function in ONE COLOR. Then graph its INVERSE in a SECOND COLOR.

ORIGINAL FUNCTION: $y = 2^x$
Domain: _____ Range: _____
X-Intercepts: _____
Y-Intercepts: _____
Increasing or Decreasing? _____
Equation of Asymptote: _____

INVERSE FUNCTION: _____
Domain: _____ Range: _____
X-Intercepts: _____
Y-Intercepts: _____
Increasing or Decreasing? _____
Equation of Asymptote: _____



MEMORIZE:

A logarithm with a base of 10 is a common logarithm. So, instead of writing $\log_{10} x$, we will write $\log x$.

A logarithm with a base of "e" is a natural logarithm. So, instead of writing $\log_e x$, we will write $\ln x$.

$\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x = e$ and $e \approx 2.718281828...$

Example 2: Rewrite each expression in logarithmic form.

a. $4^3 = 64$	b. $10^3 = 1000$	c. $e^{-2} \approx 0.14$

Example 3: Rewrite each expression in exponential form.

a. $\ln 2 \approx 0.70$	b. $\log_5 125 = 3$	c. $\log 0.1 = -1$

Example 4: Use the definition of logarithmic function to evaluate each logarithm. NO CALCULATOR!

a. $\log_2 32$	b. $\log_3 1$	c. $\log_4 2$	d. $\log_{10} \frac{1}{100}$

Example 5: Evaluate with the calculator. Round to 3 decimal places.

a. $\log 25$	b. $\ln 0.34$	c. $\log x = 2.014$	d. $\ln x = -4$	e. $\log x = 0$

MEMORIZE: Change of Base Formula

The Change of Base Formula is used in order to evaluate a logarithm with a base other than 10 in the calculator. The Change-of-Base Formula is $\log_b x = \frac{\log_a x}{\log_a b}$

Example 6: Use the change of base formula to evaluate to 3 decimal places.

a. $\log_2 15$	b. $\log_{\frac{1}{4}} 20$	c. $\log_{\sqrt{6}} 1.5$