5.2 Logarithmic Functions and Their Graphs

Exponential Form:

$y = b^x$

The inverse is:

$x = b^y$

To solve for *y* we need to use **logarithmic functions**.

Definition of a Logarithm Function:

For *b* > 0, *b* ≠ 1

$\mathrm{y} = \log_b x$ is the equivalent form of $x = b^y$ and is the inverse function of an exponential function with base b

(read as log base *b* of *x*)

Logarithmic form	**Exponent form**
$\mathrm{y} = \log_b x$	$x = b^y$

Where:
b - base

y - exponent

Note: The default log button is base 10:

ie $\mathrm{y} = \log \mathrm{x}$ is $\mathrm{y} = \log_{10} x$

Example 1:

Change from **logarithmic** to **exponential** form:

a.) $3 = \log_2 8$ b.) $-2 = \log_3 \frac{1}{9}$

Example 2:

Change from **exponential** to **logarithmic** form:

a.) $5^3 = 125$ b.) $10^{-1} = \frac{1}{10}$

Example 3:

Simplify by changing the form:

a.) $\log_{81} 3$ b.) $\log_2 8\sqrt{2}$

Logarithmic Graphs

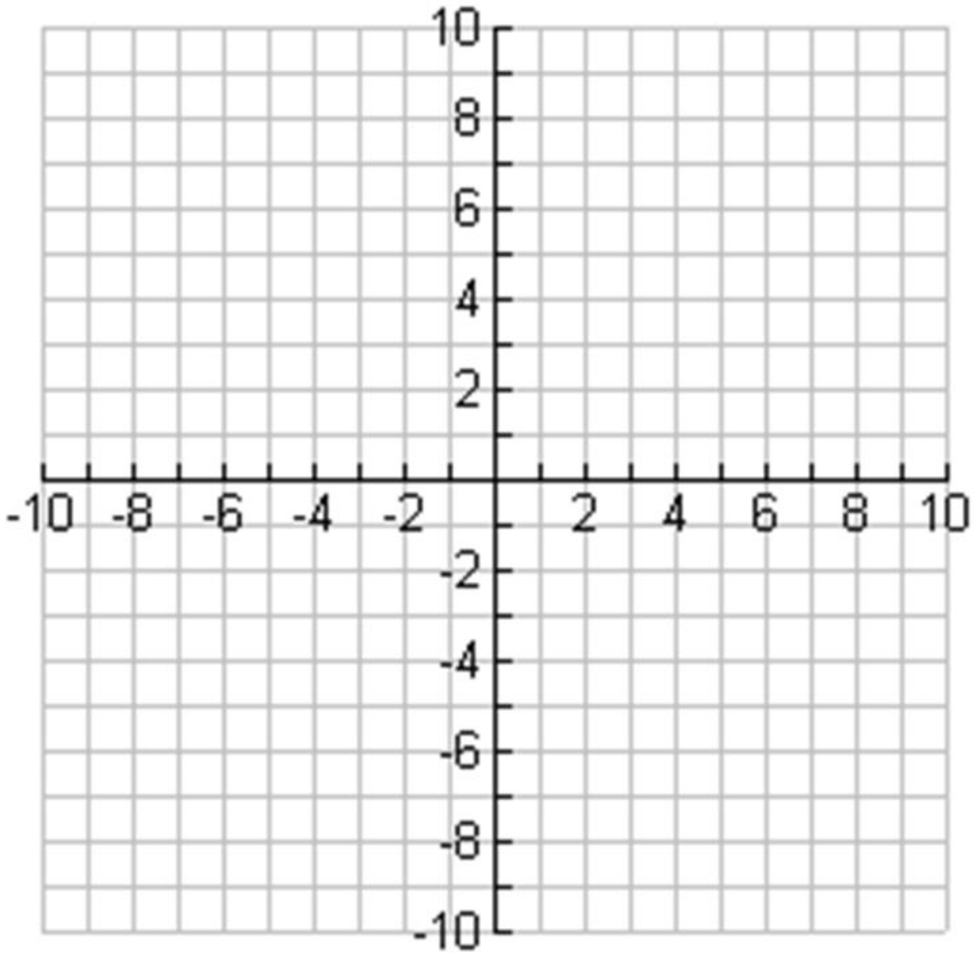
Since logarithmic and exponential graphs are inverses the properties of the exponential function is inverted. Both exponential and logarithmic functions are one-to-one (hence they are both functions)

$$b > 0, b \neq 1$$

	$y = b^x$	$y = \log_b x$
Domain:		
Range:		
Asymptote:		

Example 4:

Graph: $y = \log_2 x$



Example 5: Determine the inverse of the following:

a.) $f(x) = 3^{x+1} - 2$

b.) $f(x) = \log_3(x - 5) + 4$