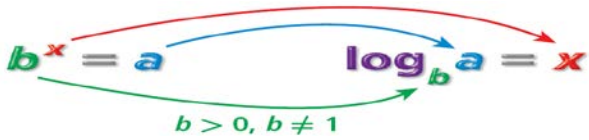
Algebra 2 Honors **Name**_____
Notes: 4.3 **Date**_____**Block**_____

I. What is a logarithm?



Reading Math: Read $\log_b a = x$, as _____.

Example 1:
Write each exponential equation in logarithmic form.

Exponential Equation	Logarithmic Form
$3^5 = 243$	
$25^{1/2} = 5$	
$10^4 = 10{,}000$	
$6^{-1} = \frac{1}{6}$	
$a^b = c$	
$9^2 = 81$	
$3^3 = 27$	
$x^0 = 1\ (x \neq 0)$	

Example 2:
Write each logarithmic equation in exponential form.

Logarithmic Form	Exponential Equation
$\log_9 9 = 1$	
$\log_2 512 = 9$ $\log_2 512 = 9$	
$\log_8 2 = \frac{1}{3}$	
$\log_4 \frac{1}{16} = -2$	
$\log_b 1 = 0$	
$\log_{10} 10 = 1$	
$\log_{12} 144 = 2$	
$\log_{1/2} 8 = -3$	

II. Special Properties of Logarithms

For any base *b*, such that $b > 0$ and $b \neq 1$.

Logarithmic Form	Exponential Form	Example
Logarithm of Base *b*		
Logarithm of 1		

Note: A logarithm with a base 10 is called a _____. If no base is written for a logarithm, the base is assumed to be 10.

III. Evaluating Logarithms Using Mental Math

Example 3:

Evaluate by using mental math.

a) $\log 0.01 =$

b) $\log_5 125 =$

c) $\log_5 \frac{1}{5} =$

d) $\log 0.00001 =$

e) $\log_{25} 0.04 =$

f) $\log_{125} 5 =$

IV. Logarithmic Function

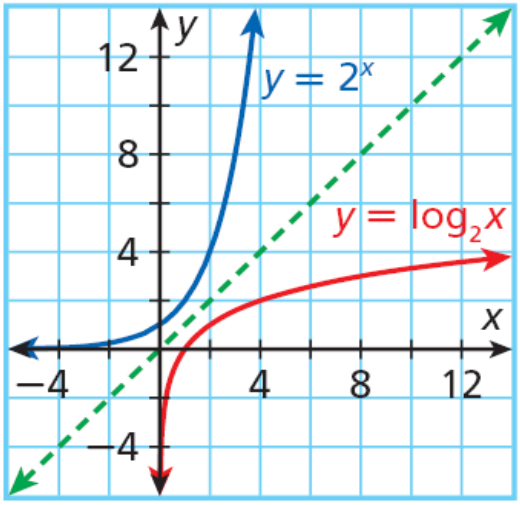
Because logarithms are the inverses of exponents, the inverse of an exponential function, such as $y = 2^x$, is a ***logarithmic function***, such as $y = \log_2 x$.

$f(x) = \log_b x$

Domain:

Range:

Vertical Asymptote:

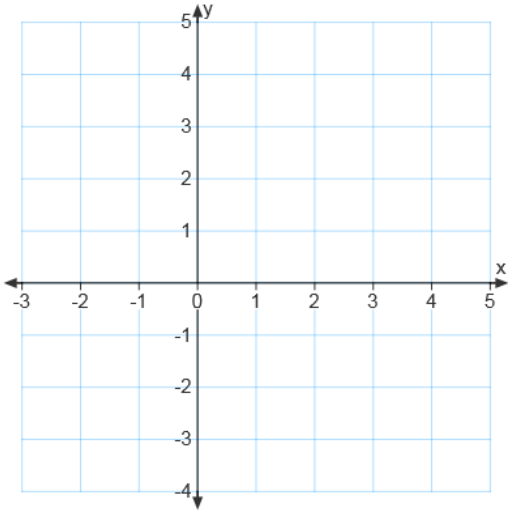


Example 4A: Graphing Logarithmic Functions

Use the given x – values {-2, -1, 0, 1, 2} to graph $f(x) = 1.25^x$. Then graph its inverse. State the domain and range of the inverse function.

x	-2	-1	0	1	2
$f(x) = 1.25^x$					

x					
$f^{-1}(x) = \log_{1.25} x$					

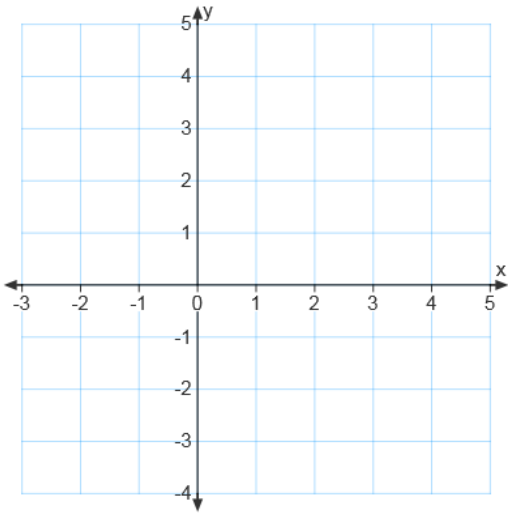


Example 4B: Graphing Logarithmic Functions

Use the given x – values {-2, -1, 0, 1, 2} to graph $f(x)=\left(\frac{1}{2}\right)^x$. Then graph its inverse. State the domain and range of the inverse function.

x	-2	-1	0	1	2
$f(x)=\left(\frac{1}{2}\right)^x$					

x					
$f^{-1}(x)=\log_{1/2} x$					



Example 5: Food Application

The table lists the hydrogen ion concentrations for a number of food items. Find the pH of each.

Substance	H^+ conc. (mol/L)	pH
Milk	0.00000025	
Tomatoes	0.0000316	
Lemon Juice	0.0063	

Note: pH = -log[H^+]