Warm Up

1) log (1/100)

2) $\log_3 -27$

3) $\log_{(1/4)} 2$

****Word Problem and Graphing Quiz!!!

*evaluating logs puzzle

Evaluating Log Practice

*Pair up to use the flash cards.

Mad Minute Quiz

Evaluating Logs on _____!!!

7.4 Graphing Logarithmic Functions

Objectives:

Find the inverse of the function.

Graph the logarithmic functions.

Find the domain and range of logarithmic functions.

Graphing Logarithmic Functions

Find the inverse.

A) $y=\ln(x+3)$

$y = \ln(x) - 2$

$x = \ln(y) - 2$

$+2 \quad +2$

$e^{x+2} = e^{\ln(y)}$

$e^{x+2} = y$

B) $y=\ln(x-4)$

$x = \ln(y-4)$

$e^x = e^{\ln(y-4)}$

$e^x = y - 4$

$+4 \quad +4$

$e^x + 4 = y$

Graphing Logarithmic Functions

Find the inverse.

A) $y=6^x$

$x = 6^y$

$6^y = x$

$\log_6 x = y$

or

$y = \log_6 x$

B) $y=4^x$

$x = 4^y$

$4^y = x$

$\log_4 x = y$

Graphing Logarithmic Functions

Find the inverse.

A) $y=\log_5 x$

$x=\log_5 y$

$\log_5 y = x$

$5^x = y$

B) $y=\log_{(1/5)} x$

$x=\log_{\frac{1}{5}} y$

$\log_{\frac{1}{5}} y = x$

$\left(\frac{1}{5}\right)^x = y$

$y=\left(\frac{1}{5}\right)^x$

Graphing Logarithmic Functions

To sketch the graph of $y=\log_b x$, you can use the fact that the graphs of inverse functions are reflections of each other in the line y=x.

In the same coordinate plane, sketch the graph of each function.

$y=2^x$

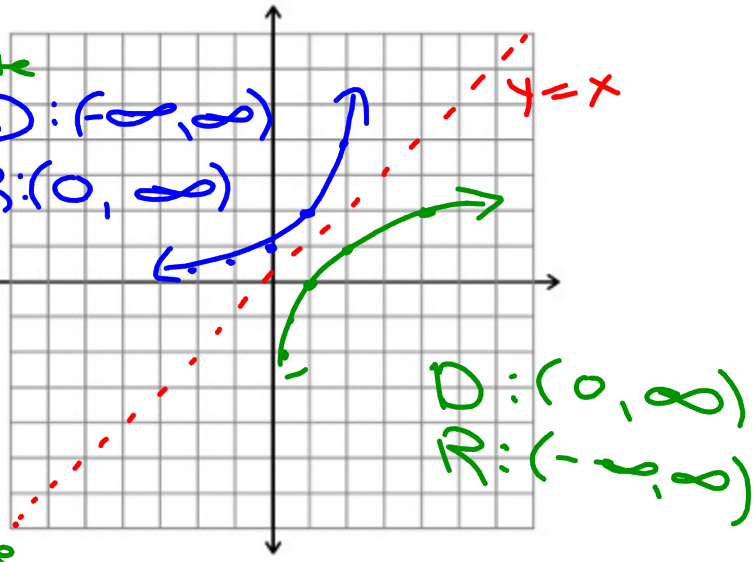
asymptote $y=\#$

x	y
-2	$2^{-2}=\frac{1}{4}$
-1	$2^{-1}=\frac{1}{2}$
0	$2^0=1$
1	$2^1=2$
2	$2^2=4$

$y=\log_2 x$

asymptote $x=\#$

x	y
$\frac{1}{4}$	-2
$\frac{1}{2}$	-1
1	0
2	1
4	2



1 | 2

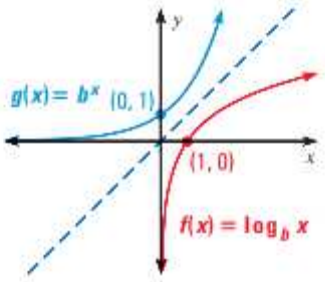
GRAPHING LOGARITHMIC FUNCTIONS You can use the inverse relationship between exponential and logarithmic functions to graph logarithmic functions.

KEY CONCEPT *For Your Notebook*

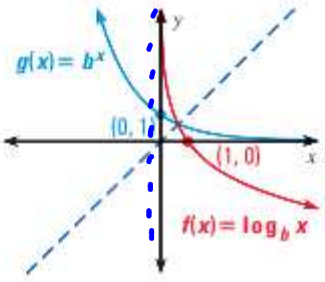
Parent Graphs for Logarithmic Functions

The graph of $f(x) = \log_b x$ is shown below for $b > 1$ and for $0 < b < 1$. Because $f(x) = \log_b x$ and $g(x) = b^x$ are inverse functions, the graph of $f(x) = \log_b x$ is the reflection of the graph of $g(x) = b^x$ in the line $y = x$.

Graph of $f(x) = \log_b x$ for $b > 1$



Graph of $f(x) = \log_b x$ for $0 < b < 1$



Note that the y-axis is a vertical asymptote of the graph of $f(x) = \log_b x$. The domain of $f(x) = \log_b x$ is $x > 0$, and the range is all real numbers.

Graphing Logarithmic Functions

Graph:

$y=\log_3 x$

$x=\log_3 y$

$\log_3 y = x$

$3^x = y$

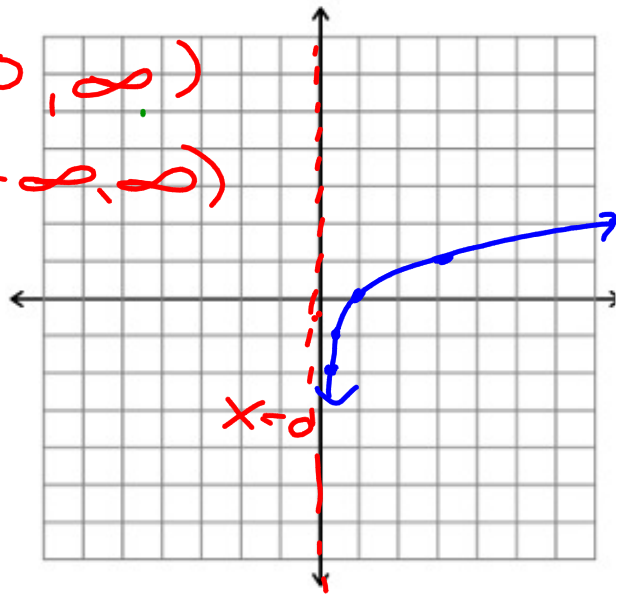
x	y
-2	$3^{-2}=\frac{1}{9}$
-1	$3^{-1}=\frac{1}{3}$
0	$3^0=1$
1	$3^1=3$
2	$3^2=9$

x	y
$\frac{1}{9}$	-2
$\frac{1}{3}$	-1
1	0
3	1
9	2

Aysmptote

D: $(0, \infty)$

R: $(-\infty, \infty)$



TOYO

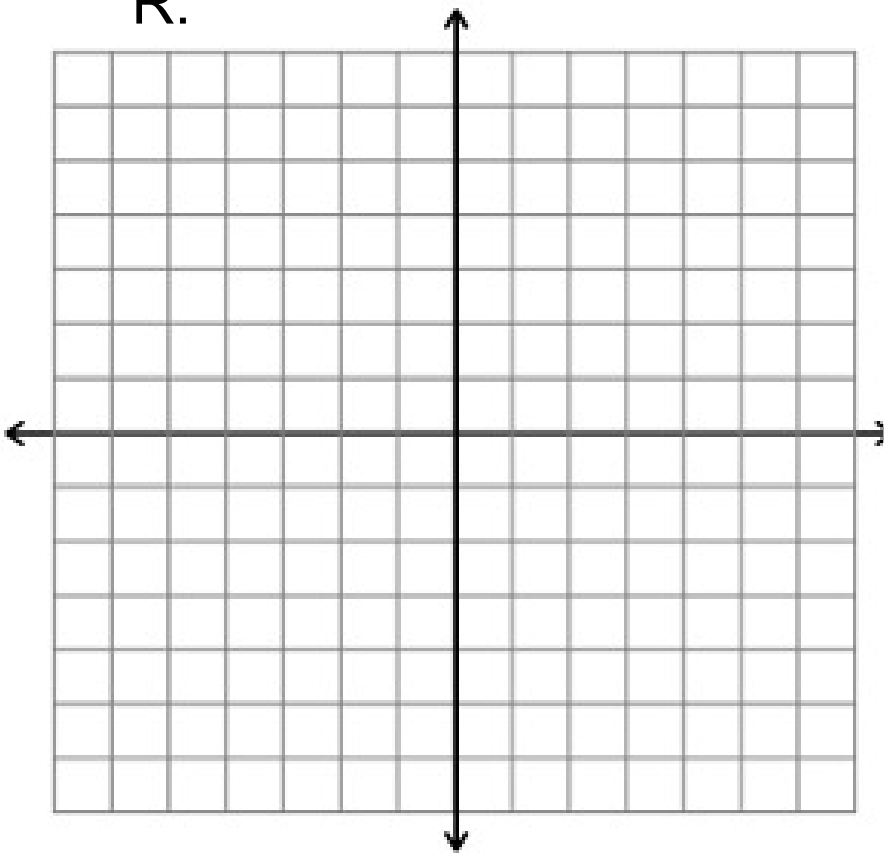
Graphing Logarithmic Functions

D:

R:

Graph:

$y=\log_4 x$



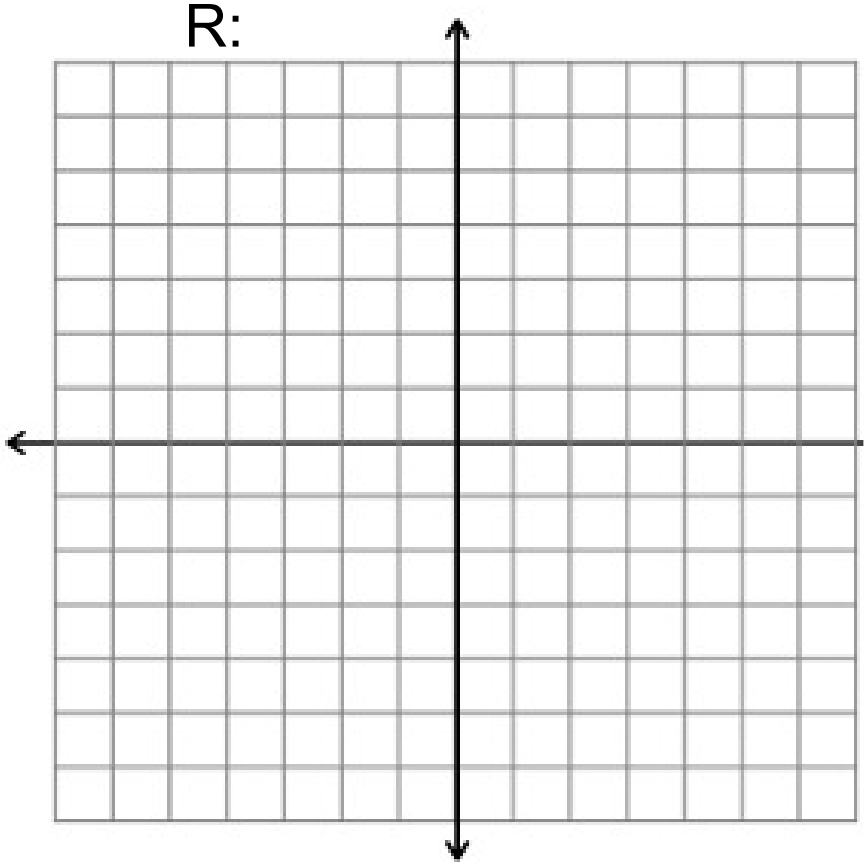
Graphing Logarithmic Functions

Graph:

$y=\log_{(1/2)} x$

D:

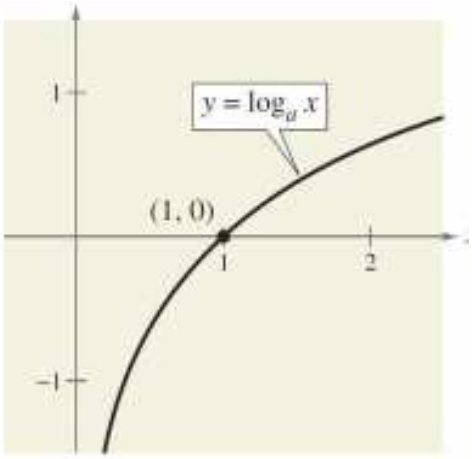
R:



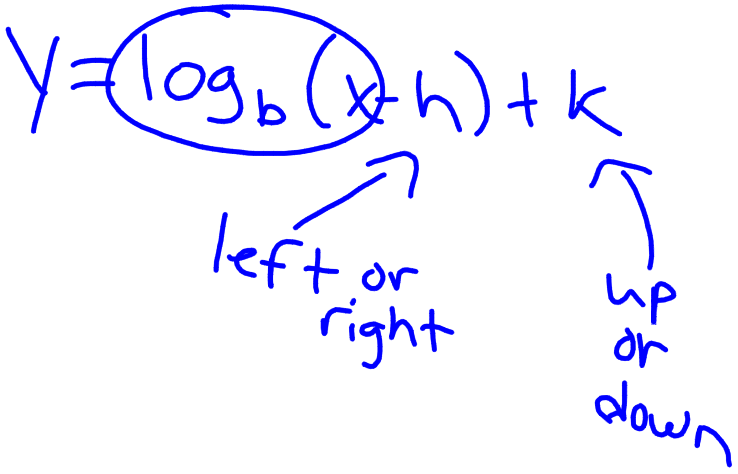
Characteristics of Logarithmic Graphs

Graph of $y = \log_a x$, $a > 1$

- Domain: $(0, \infty)$
- Range: $(-\infty, \infty)$
- x-intercept: (1, 0)
- Increasing
- One-to-one, therefore has an inverse function



TRANSLATIONS You can graph a logarithmic function of the form $y = \log_b (x - h) + k$ by translating the graph of the parent function $y = \log_b x$.



Graphing Logarithmic Functions

Graph

$y=\log_2(x+3)+1$

left +3 up 1

asymptote $x=-3$

$x=\log_2 y$

$\log_2 y = x$

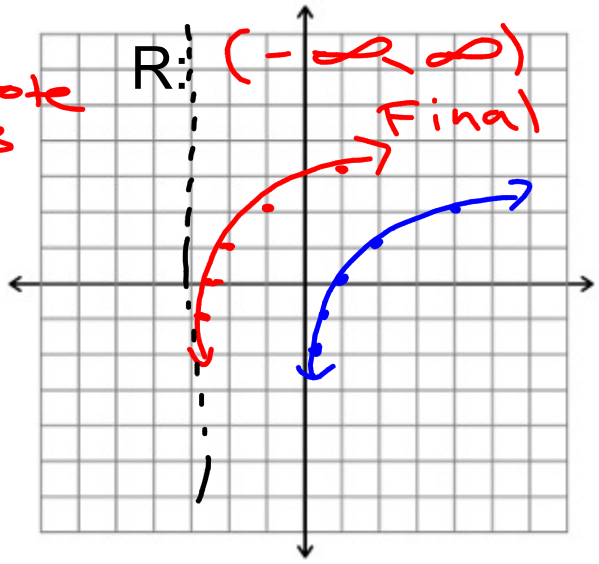
$2^x = y$

x	y
-2	$\frac{1}{4}$
-1	$\frac{1}{2}$
0	1
1	2
2	4

x	y
$\frac{1}{4}$	-2
$\frac{1}{2}$	-1
1	0

D: $(-3, \infty)$

R: $(-\infty, \infty)$



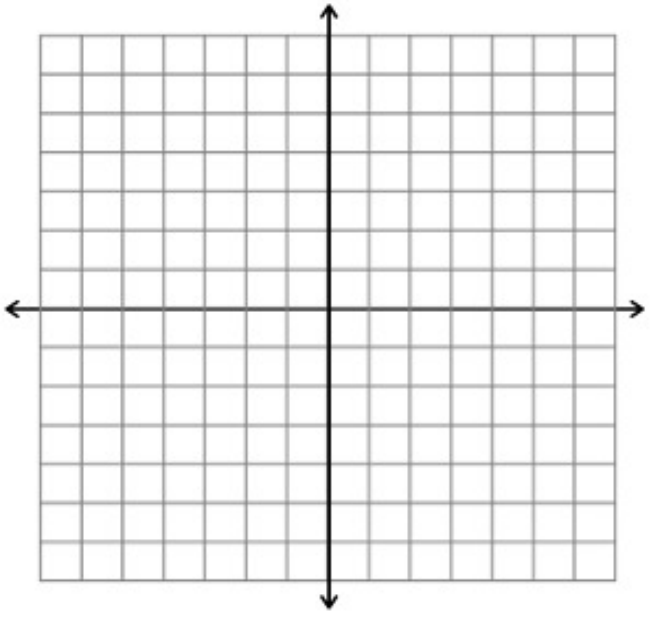
Graphing Logarithmic Functions

Graph

$y=\log_3(x-2)+4$

D:

R:



HW: Page 504 #39-44, 45-53odd,59-61