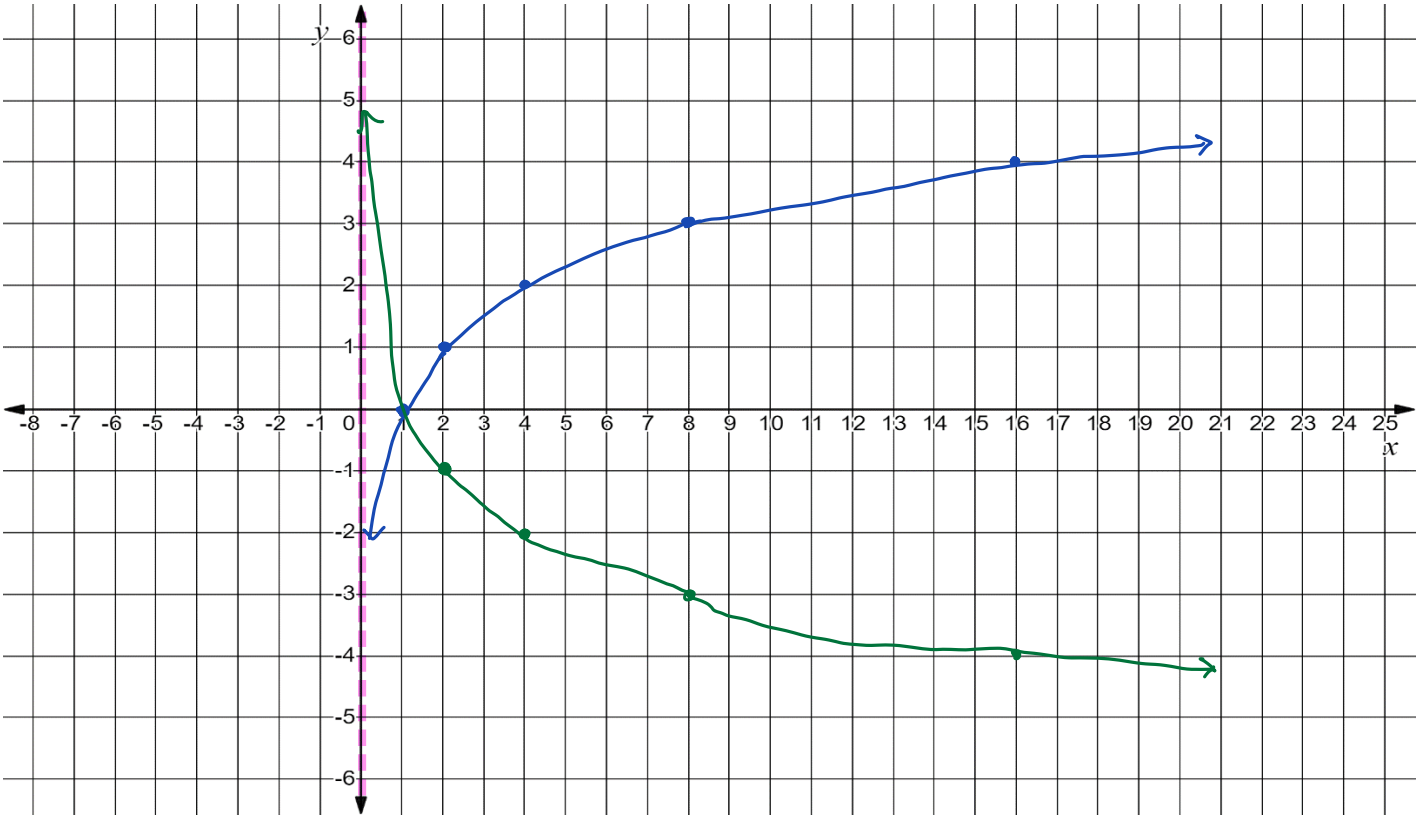
Name: _____ Date: _____

Learning Goal 7.1	Applying one or more transformations to exponential and logarithmic functions, including translations, stretches and reflections.

Recall the logarithmic function is the inverse of the exponential function. Use this idea to graph

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

a. $y = \log_2 x$ b. $y = \log_{1/2} x$



x	0	1	2	3
y	1	2	4	8

$2^x \Rightarrow \log_2 x$

inverses

y	0	1	2	3
x	1	2	4	8

Compare	$y = \log_2 x$	$y = \log_{1/2} x$
Vertical intercept (y-int)	none	none
Horizontal intercept (x-int)	$x = 1$	$x = 1$
Domain & Range	$\{x \mid x > 0, x \in \mathbb{R}\}$ $\{y \mid y \in \mathbb{R}\}$	$\{x \mid x > 0, x \in \mathbb{R}\}$ $\{y \mid y \in \mathbb{R}\}$
Asymptote	$x = 0$	$x = 0$

Assignment p. Quiz Next Day!

only changed by horizontal translations.

Properties of the graph of the Logarithmic Function $y = \log_b x \quad b > 0, b \neq 1, x > 0$

Vertical intercept – none without a horizontal translation to the left.

Horizontal intercept – always!

Asymptote Equation – only be moved by a horizontal translation.

Domain and Range → $\{y \mid y \in \mathbb{R}\}$ → limited by asymptote

Example Graph the function on the grids below, then complete the table.

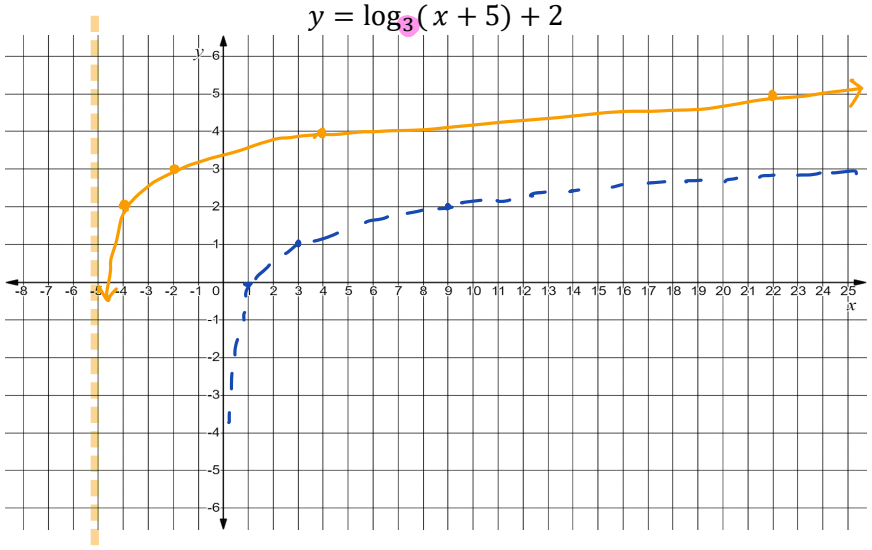
$y = \log_3(x + 5) + 2$

3^x

x	y
0	1
1	3
2	9

$\log_3 x$

x	y
1	0
3	1
9	2



Domain

$\{x \mid x > -5, x \in \mathbb{R}\}$

Range

$\{y \mid y \in \mathbb{R}\}$

x – intercept

$-5 < x < -4$

y – intercept

$3 < y < 4$

Asymptote

$x = -5$

y	$+2$
0	2
1	3
2	4
3	5

x	-5
1	-4
3	-2
9	4
27	22

The Richter scale: Each increase of 1 unit in magnitude on the Richter scale represents a 10 – fold increase in intensity as measured on a seismometer. The intensity, A, of an earthquake that has a Richter magnitude of R units greater than that of an earthquake with intensity A_0 is given by the formula:

Richter Number	1	2	3	4	5	6	7	8
Intensity	10^1	10^2	10^3	10^4	10^5	10^6	10^7	10^8
Effect	Detectable only by seismograph	Hanging objects sway	Can be felt by humans	Glass breaks, buildings sway	Furniture collapses	Wooden houses damaged	Buildings collapse	Catastrophic damage

$$A = A_o \times 10^R$$

a. How many times as intense as the 1989 San Francisco earthquake, which measured 6.9 on the Richter scale, was the 1964 Alaska earthquake, measuring 8.5?

$$\frac{\text{Alaska}}{\text{SF}} = \frac{A_0 \times 10^{8.5}}{A_0 \times 10^{6.9}} = \frac{10^{8.5}}{10^{6.9}} = 10^{8.5-6.9} = 10^{1.6}$$

$= 40 \times$ STRONGER.

b. Calculate the magnitude of an earthquake that is twice as intense as the 1989 San Francisco earthquake.

$\log_{10}(10^x) = \log_{10}(2)$

$x = \log 2$

$x = 0.3$

$R - 6.9 = 0.3$

$R = 7.2$

Assignment p. The earthquake would have a magnitude of 7.2

Quiz Next Day!