Algebra 2 GT
Log Graphs and Inverses

Name ____________________

Graphs of Logarithms

Based on everything you have learned about graphs of functions this year, what could you say about the graph of the standard log function shown below?

$$y = a\log_b(x-h)+k$$

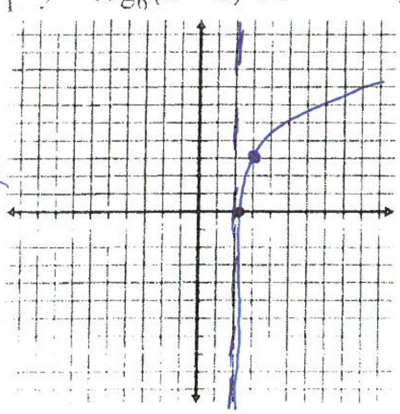
a - stretch / compress / reflect
h - shift left / right ← changes domain + asymptote
k - shift up / down

Using this information, graph the functions shown below.

1. $y = \log_6(x-2)+3$

x = 2

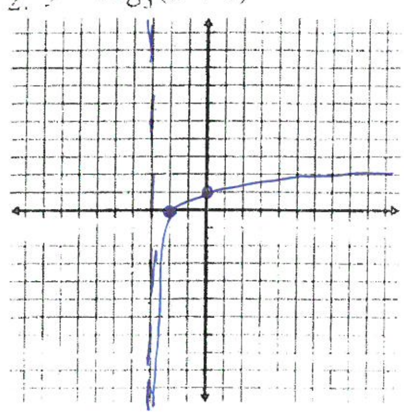
D: x>2
R: ℝ
x = 2
(2.004, 0)



$y = \log_6(x-2)+3$
$y-3 = \log_6(x-2)$
$6^{(y-3)} = x-2$
$6^{(y-3)}+2 = x$
$6^{(0-3)}+2 =$
$.005 + 2 = 2.005$
(2.005, 0)
$6^{(3-3)}+2 = 3$
(3, 3)

2. $y = \log_3(x+3)$

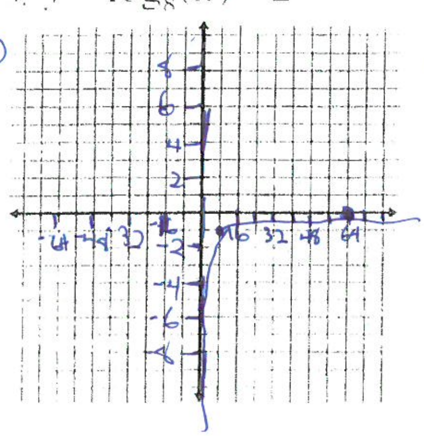
D: x>-3
R: ℝ
x = -3
(-2, 0)



$3^y = x+3$
$3^y - 3 = x$
$3^0 - 3 = x = -2$
(-2, 0)
$3^1 - 3 = x = 0$
(0, 1)

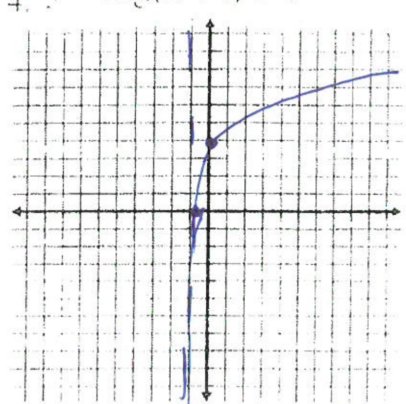
3. $y = \log_8(x)-2$

D: x>0
R: ℝ
x = 0
(64, 0)



$y+2 = \log_8(x)$
$8^{(y+2)} = x$
$8^{(0+2)} = x = 64$
(64, 0)
$8^{(-1+2)} = x$
8 = x
(8, -1)

4. $y = \log(x+1)+4$



D: x > -1
R: ℝ
x = -1
(-.9999, 0)

$y-4 = \log_{10}(x+1)$
$10^{(y-4)} = x+1$
$10^{(y-4)} - 1 = x$
$10^{(0-4)} - 1 = x$
(-.9999, 0)
$10^{(4-4)} - 1 = x$
0 = x
(0, 4

Inverses of Logarithm/Exponential Functions

What do you know about logarithm and exponential functions?

They are inverses of one another.

Using this information, find the inverse of the following functions. Identify the domain and range of the original function as well as the domain and range of its inverse.

1. $y = \log_3(x)$ D: $x>0$ R: $\mathbb{R}$

$x = \log_3(y)$

Inverse $3^x = y$

D: $\mathbb{R}$

R: $y>0$

2. $y = 5^{x-1}$ D: $\mathbb{R}$ R: $y>0$

$x = 5^{y-1}$

$\log_5(x) = y-1$

$\log_5(x) + 1 = y$ Inverse

D: $x>0$

R: $\mathbb{R}$

3. $y = \log_7(2x+4) - 1$ D: $x>-2$ R: $\mathbb{R}$

$\log_7(2(x+2)) - 1$

$x = \log_7(2y+4) - 1$

$x+1 = \log_7(2y+4)$

$7^{(x+1)} = 2y+4$

$7^{(x+1)} - 4 = 2y$

Inverse $\frac{1}{2}\left(7^{(x+1)} - 4\right) = y$

D: $\mathbb{R}$

R: $y>-2$

4. $y = 2^{3x} - 9$ D: $\mathbb{R}$ R: $y>-9$

$x = 2^{3y} - 9$

$x+9 = 2^{3y}$

$\log_2(x+9) = 3y$

$\frac{1}{3}(\log_2(x+9)) = y$ Inverse

D: $x>-9$

R: $\mathbb{R}$