Pre-Calculus 12 — Name:______________________

7.6 – Analyzing Logarithmic Functions — Block: __________

Compare $y=\log_a x$ to $\boxed{y=a^x}$. What do you notice?

$\Downarrow$

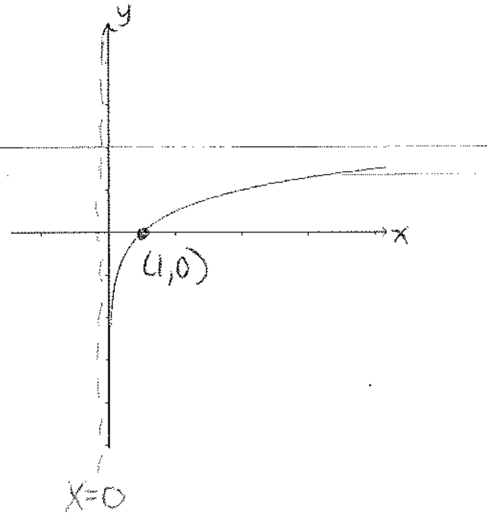
$a^y = x$

or $\boxed{x=a^y}$

- x and y are switched
- reflection in line $y=x$

$\Rightarrow$ $y=\log_a x$ is the inverse of $y=a^x$

<u>In General</u>: For $y=\log_a x$ $(a>1, a\neq 1)$,



Asymptote: $x=0$

x – int: 1

y – int: none

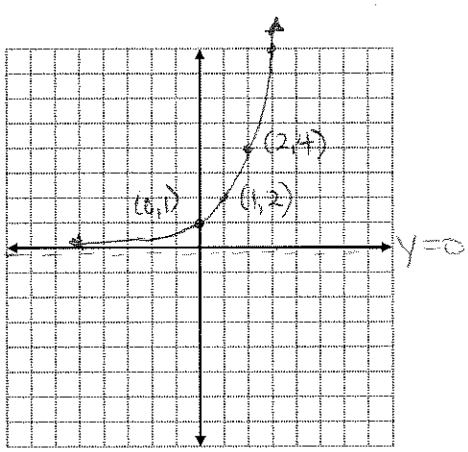
Domain: $x>0$

Range: $y\in\mathbb{R}$

1. Graph the following:

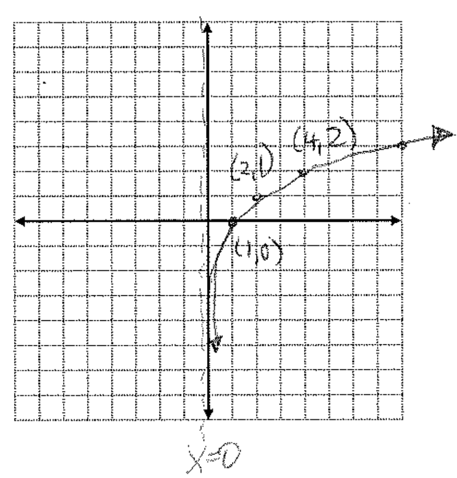
a) $y=2^x$

x	y
-3	$\frac{1}{8}$
-2	$\frac{1}{4}$
-1	$\frac{1}{2}$
0	1
1	2
2	4
3	8



b) $y=\log_2 x$ switch x and y!

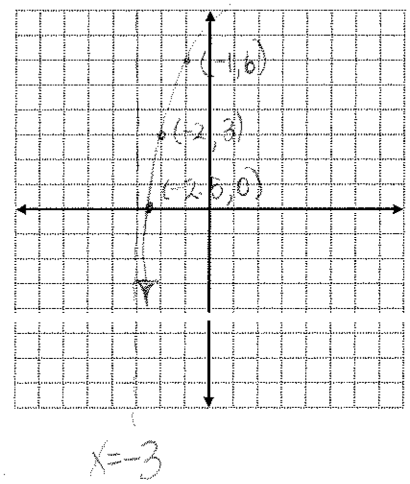
x	y
$\frac{1}{8}$	-3
$\frac{1}{4}$	-2
$\frac{1}{2}$	-1
1	0
2	1
4	2
8	3



c) $y=3\log_2(2x+6)$ $\Rightarrow y = 3\log_2 2(x+3)$

VE 3   HC $\frac{1}{2}$ 3 left   inverse of $y=2^x$

		x	y	
$-2\frac{15}{16}$	$\frac{1}{16}$	$\frac{1}{8}$	-3	-9
$-2\frac{7}{8}$	$\frac{1}{8}$	$\frac{1}{4}$	-2	-6
$-2\frac{3}{4}$	$\frac{1}{4}$	$\frac{1}{2}$	-1	-3
		1	0	0
$-2\frac{1}{2}$	$\frac{1}{2}$			
-2	1	2	1	3
-1	2	4	2	6
1	4	8	3	9



Asymptote: $x=-3$

x – int: -2.5

y – int: approx. 7.5

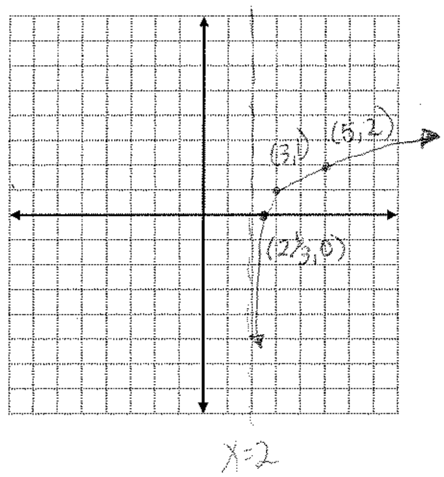
Domain: $x > -3$

Range: $y \in \mathbb{R}$

2. Graph $y=\log_3(x-2)+1$ ← up 1, 2 right

inverse of $y=3^x$

		x	y
$2\frac{1}{27}$	$\frac{1}{27}$	-3	-2
$2\frac{1}{9}$	$\frac{1}{9}$	-2	-1
$2\frac{1}{3}$	$\frac{1}{3}$	-1	0
3	1	0	1
5	3	1	2
11	9	2	3
29	27	3	4



Asymptote: $x=2$

x – int: $2\frac{1}{3}$

y – int: none

Domain: $x > 2$

Range: $y \in \mathbb{R}$

When the graph $y = a^x$ is transformed, the resulting equation can be written as $y=c\log_a d(x-h)+k$ (where $c \neq 0$ and $d \neq 0$). What affect does each variable have on the graph?

c: vertical expansion/compression + reflection

d: horizontal expansion/compression + reflection

h: translation ~~left~~ left/right

k: translation up/down

p. 432 # 10, 11, 16; p. 462 # 8-10 (# 11 challenge)