Intermediate Algebra
8.4 Notes Day 2

Graphing Logarithmic Functions

What do you remember about inverses?

we find inverses by switching the input (x) & output (y) values

Find the inverse of the given function.

1) $y = \log_3 x$

$x = \log_3 y$

$3^x = y$

$\boxed{y^{-1} = 3^x}$

2) $y = \log_{\frac{1}{2}} x$

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

$\frac{1}{2}^x = y$

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

Inverse functions: The logarithmic function ($\boldsymbol{f(x) = \log_b x}$) and exponential function ($\boldsymbol{g(x) = b^x}$) are inverses of each other.

This means the following are true:

$f(g(x)) =$ x

$f(b^x) = \log_b b^x$
$= x$

and

$g(f(x)) =$ x

$g(\log_b x) = b^{\log_b x}$
$= x$

These properties help us to evaluate some special logarithms

Examples:

a. $10^{\log_{10} 9}$

9

b. $4^{\log_4 5}$

5

c. $\log_3 3^4$

4

d. $\log_2 8^x = \log_2 (2^3)^x$

or

$\log_2 2^{3x}$

3x

Since logarithmic functions and exponential functions are inverses of each other, as we move on to graphing pay attention to how this affects each graph.

To graph: 1) Draw in the **vertical** asymptote. 2) Make a table using 1 and b as your x values (this should be done using the ***parent function*** just like with exponential functions). 3) Translate if necessary. 4) Plot the points and sketch the curve.

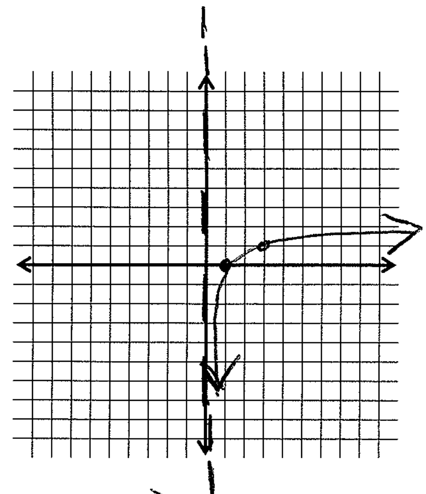
Ex 1) Graph the following:

parent function → $f(x) = \log_3 x$

$y = \log_3 1 \rightarrow 3^y = 1$

$y = \log_3 3 \rightarrow 3^y = 3$

x	y
1	0
3	1



Asymptote: $x = 0$ Domain: $(0, \infty)$ Range: $(-\infty, \infty)$

x-int: $(1, 0)$ y-int:

Ex 2) Graph the following:

$f(x) = \log_2(x - 3)$

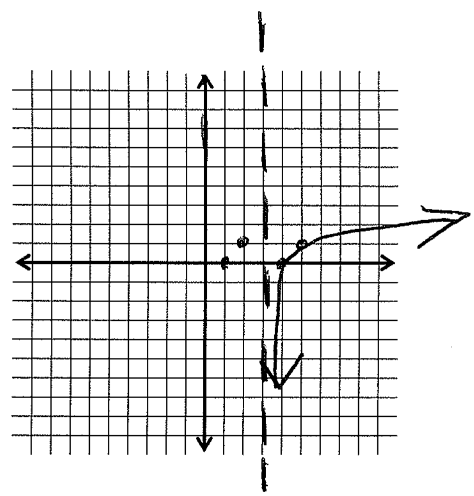
parent

$y = \log_2 x$

$y = \log_2 1 \rightarrow 2^y = 1$

$y = \log_2 2 \rightarrow 2^y = 2$

x	y
1	0
2	1



Describe the shift: right 3

Asymptote: $x = 3$ Domain: $(3, \infty)$ Range: $(-\infty, \infty)$

x-int: $(4, 0)$ y-int:

Characteristics of Logarithmic Functions

Remember: $\log_b 1 =$ 0 and $\log_b b =$ 1

Asymptote: $x =$ vertical Domain: (asy, ∞) Range: $(-\infty, \infty)$

for the most part