NOTES CHAPTER 6 Name: Key

Section 6.1 Logarithms and Logarithmic Functions

I understand the definition of a logarithm
I can convert between logarithmic form and exponential form
I can use exponential form to solve a log problem
I can graph $f(x) = log_b x$
I can graph transformations of log functions

Definition of Logarithm with base b:

Let b and y be positive numbers with $b \neq 1$.
The logarithm of y with base b is denoted $\log_b y$ is defined as follows:

$$\log_b y = x \text{ if and only if } b^x = y$$

The expression $\log_b y$ is read as "log base b of y" $\log_b x = y$ if and only if $b^y = x$

I can convert between logarithmic form and exponential form

	Logarithmic form	Exponential form
a.	$\log_2 32 = 5$	$2^5 = 32$
b.	$\log_7 1 = 0$	$7^0 = 1$
c.	$\log_{13} 13 = 1$	$13^1 = 13$
d.	$\log_{\frac{1}{2}} 2 = -1$	$\frac{1}{2}^{-1} = 2$

Checkpoint: Rewrite the equation in exponential form.

1. $\log_{18} 1 = 0$
2. $\log_2 64 = 6$

I can use exponential form to solve a log problem

a. $\log_3 81 = x$ $3^x = 81$; $x = 4$

b. $\log_4 0.25 = x$ $4^x = 0.25$; $x = -1$

c. $\log_{\frac{1}{4}} 256 = x$ $\frac{1}{4}^x = 256$ $x = -4$

d. $\log_{49} 7 = x$ $49^x = 7$; $x = \frac{1}{2}$

Checkpoint: Evaluate the logarithm.

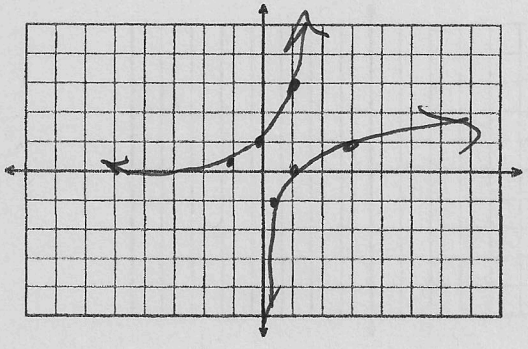
3. $\log_{\frac{1}{3}} 9 = x$
4. $\log_{16} 4 = x$

I can graph $f(x) = log_b x$

$y = 3^x$ Domain: $\mathbb{R}$ Range: $(0, \infty)$

$y = log_3 x$ Domain: $(0, \infty)$ Range: $\mathbb{R}$

x	y
-1	1/3
0	1
1	3



$y = log_3 x$

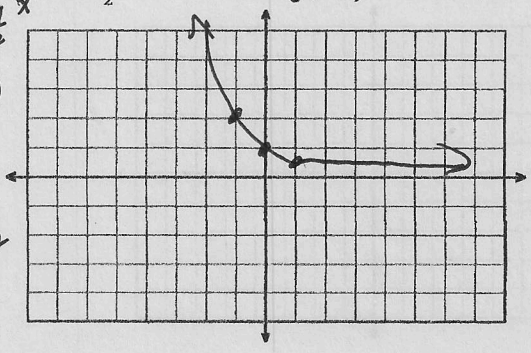
$3^y = x$

x	y
1/3	-1
1	0
3	1

$y = \frac{1}{2}^x$ Domain: $\mathbb{R}$ Range: $(0, \infty)$

$y = \log_{\frac{1}{2}} x$ Domain: $(0, \infty)$ Range: $\mathbb{R}$

x	y
-1	2
0	1
1	1/2



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

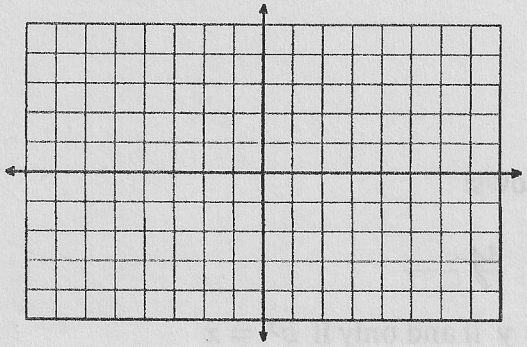
$\frac{1}{2}^y = x$

x	y
2	-1
1	0
1/2	1

Checkpoint: Graph $f(x) = log_b x$

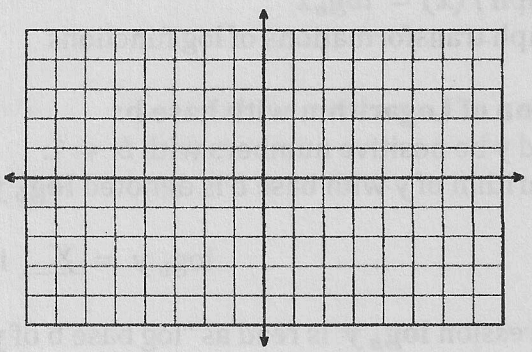
$f(x) = log_5 x$

Domain: Range:



$f(x) = log_{\frac{1}{3}} x$

Domain: Range:



Graph logarithmic functions with translations:

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

Graph:

$f(x) = log_3(x - 2) + 3$

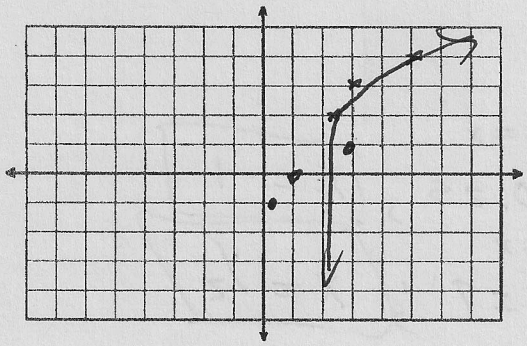
right 2, up 3

Domain: $(2, \infty)$ Range: $\mathbb{R}$

$y = log_3 x$

$3^y = x$

x	y
1/3	-1
1	0
3	1



$f(x) = -2log_{\frac{1}{4}} x - 1$

down 1

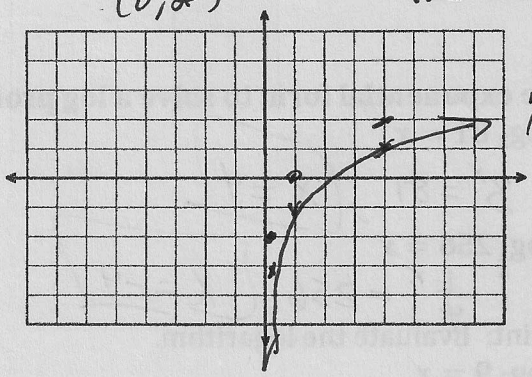
$y = log_{\frac{1}{4}} x$

$\frac{1}{4}^y = x$

Flip x-axis and stretch by 2

x	y	-2y
4	-1	2
1	0	0
1/4	1	-2

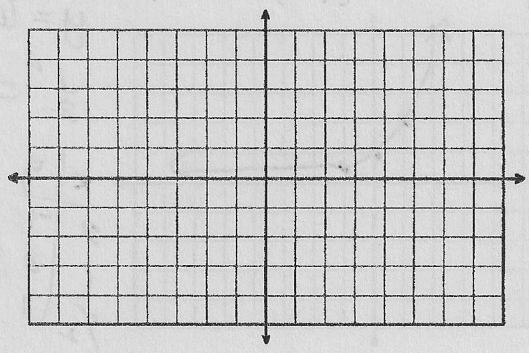
Domain: $(0, \infty)$ Range: $\mathbb{R}$



Checkpoint: Graph logarithmic functions with transformations.

$f(x) = log_4(x + 3) - 2$

Domain: Range:



$f(x) = 3log_{\frac{1}{2}} x + 2$

Domain: Range: