Key

F-B Staple 62

Logs to Exponential, Evaluating Logs, and Graphing Logs

Definition:

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

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

(logarithmic form) (exponential form)

The expression $log_b y$ is read as "log base b of y"

*When there is no base, the base is 10

Example 1.) Rewrite the logarithmic equations in exponential form.

a.) $log_2 8 = 3$ $2^3 = 8$

b.) $log_4 1 = 0$ $4^0 = 1$

c.) $log_{12} 12 = 1$ $12^1 = 12$

d.) $log_{\frac{1}{4}} 4 = -1$ $\left(\frac{1}{4}\right)^{-1} = 4$

Example 2.) Evaluate the logarithm.

a.) $log_4 64$ $4^x = 64$ $x = 3$

b.) $log_5 0.2$ $5^x = .2$ $5^x = \frac{2}{10} = \frac{1}{5}$ $x = -1$

c.) $log_{\frac{1}{5}} 125$ $\left(\frac{1}{5}\right)^x = 125$ $x = -3$

d.) $log_{36} 6$ $36^x = 6$ $x = \frac{1}{2}$

Homework: p472 1-7, 13-36, 65, 67, 68, 70

Definition:

Graphing Logarithmic Functions – You can use the inverse relationship between exponential and logarithmic functions to graph logarithmic functions.

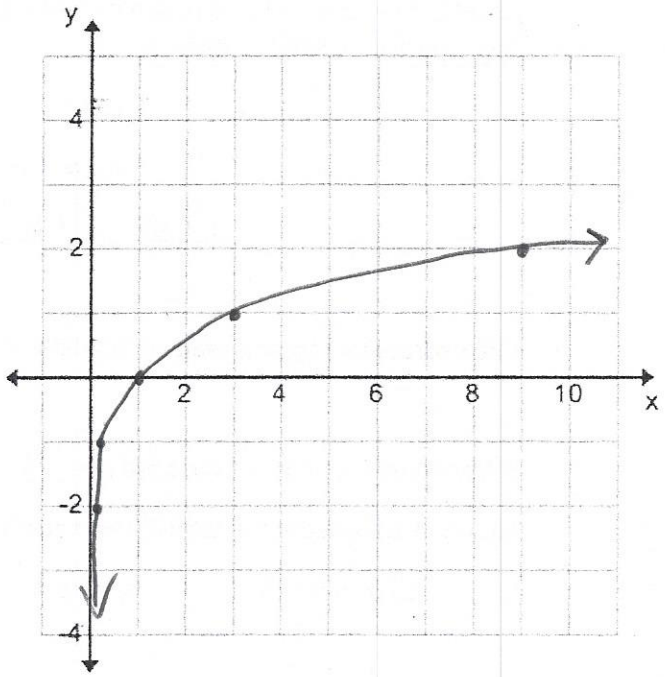
Example 6.) Graph the function, state the domain, state the range, and state the asymptote.

* Work Backward

a.) $y = log_3 x$

$3^y = x$

x	y
$\frac{1}{9}$	-2
$\frac{1}{3}$	-1
1	0
3	1
9	2

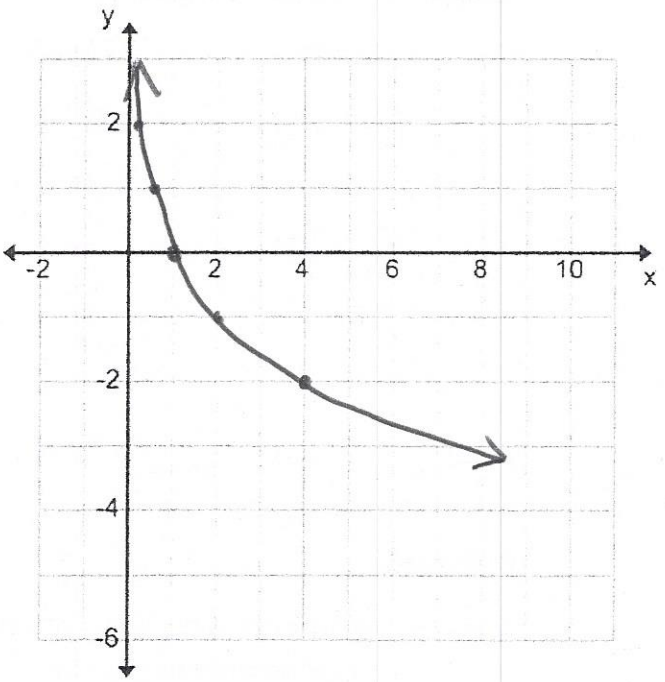


D: $(0, \infty)$ R: $(-\infty, \infty)$ V.A: $x = 0$

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

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

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



D: $(0, \infty)$ R: $(-\infty, \infty)$ V.A: $x = 0$

Definition:

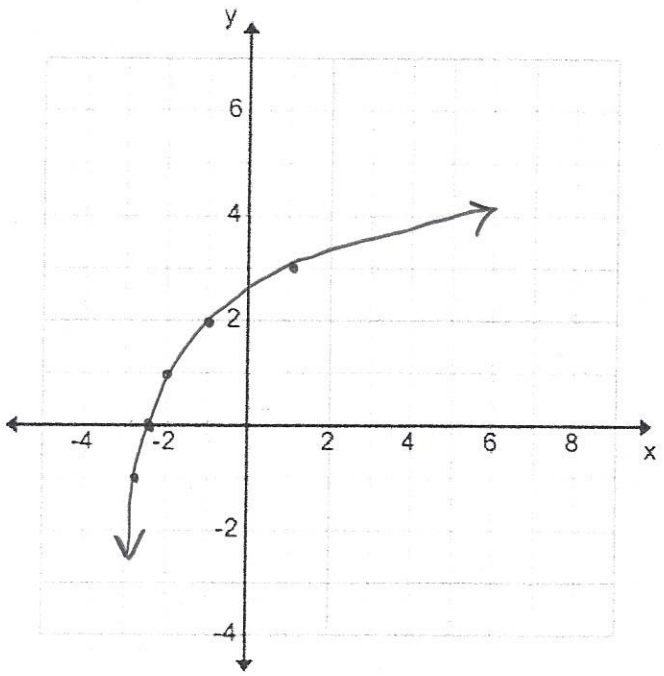
Translations of Logarithmic Graphs – You can graph a logarithmic function of the form $y = log_b(x - h) + k$ by translating the graph of the parent function $y = log_b x$.

Example 7.) Graph $y = log_2(x + 3) + 1$. State the domain, the range, and the asymptote.

$y = \log_2 x$

$2^y = x$

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



D: $(-3, \infty)$ R: $(-\infty, \infty)$ A: $x = -3$