

1) Find the percent of decrease of:

$$y = 2(0.65)^x$$

35% ↓

r

$$b = 1 + r$$

$$0.65 = 1 + r$$

$$-1 \quad -1$$

$$-.35 = r$$

2) You buy a car for 15,000 dollars.
It depreciates at a rate of 2.4% per
year. What is the car worth after
after 6 years.

$$a = 15,000$$

$$b = 1 + r \quad y = 15,000(.976)^x$$

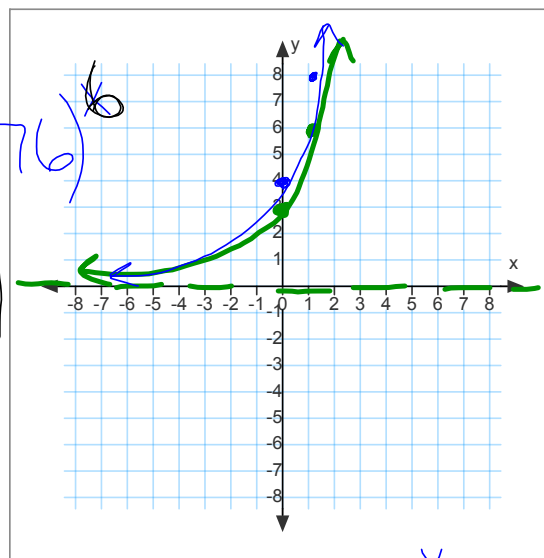
$$r = -.024$$

$$b = .976$$

$$y = \$12,965.45$$

3) Graph $y = 3(2)^x$

x	y
0	3
1	6



$$y = 4(2)^x$$

x	y
0	4
1	8

Homework Quiz

Graph $y = 2(4)^x$

you must have
2 Points at least

8.3 Logarithmic Functions as Inverses

A logarithm is another way to write an exponent.

An exponent is written as $\text{base}^{\text{exponent}} = \text{answer}$

A logarithm is written as $\log_{\text{base}} \text{answer} = \text{exponent}$

Example

Exponent

$$5^2 = 25$$



Logarithm

$$\log_5 25 = 2$$

Write each equation in logarithmic form.

Questions	Answers	Correct Answers
1. $2^4 = 16$	1. <u>$\log_2 16 = 4$</u>	1. $\log_2 16 = 4$
2. $4^5 = 1024$	2. <u>$\log_4 1024 = 5$</u>	2. $\log_4 1024 = 5$
3. $7^3 = 343$	3. <u>\log</u>	3. $\log_7 343 = 3$
4. $16^{\frac{1}{4}} = 2$	4. <u>\log</u>	4. $\log_{16} 2 = \frac{1}{4}$
5. $5^3 = 125$	5. <u>\log</u>	5. $\log_5 125 = 3$

If the base is not written in the log,
it is automatically base 10

For example:

$\log 100$ means $\log_{10} 100$

$$\log_{10} 100$$
$$\log_{10} 3$$

So what is the value of $\log 100$?

$$\log_{10} 100 = X$$

↓

$$10^X = 100$$
$$X = 2$$

Evaluating Logarithmic equations

First change the equation into an exponential equation then solve.

STEP 1 - Change to an exponential equation

For example

$$\log_2 x = 3$$



Evaluate

$$\log_2 x = 3$$

$$\downarrow$$
$$2^3 = x$$

STEP 2 - Solve for x

$$x = 8$$



Evaluate

$$\log 10,000$$

$$\log_{10} 10,000 = x$$



$$10^x = 10,000$$

$$x = 4$$

Evaluate the following logarithmic equations and expressions.

$$\log_2 32 = \cancel{X}$$

$$\log_5 125 = \cancel{X}$$

$$\log_7 x = 2$$

5

3

49

$$10^x = \frac{1}{100}$$

$$\log \frac{1}{100} = \cancel{X}$$

$$64^x = 8$$

$$\log_{64} 8 = \cancel{X}$$

$$\log_7 x = 0$$

 $\frac{1}{2}$

1

-2

$$\cancel{X} = -$$

$$8^{2x} = 8^1$$

$$2x = 1$$

Change the following logarithms to exponential equations.

Questions

1. $\log_9 3 = \frac{1}{2}$

2. $\log 10 = 1$

3. $\log_4 64 = 3$

4. $\log_5 \frac{1}{25} = -2$

5. $\log_7 49 = 2$

Answers

1. $9^{1/2} = 3$

2. $10^1 = 10$

3. $4^3 = 64$

4. $5^{-2} = \frac{1}{25}$

5. $7^2 = 49$

Correct Answers

1. $9^{1/2} = 3$

2. $10^1 = 10$

3. $4^3 = 64$

4. $5^{-2} = \frac{1}{25}$

5. $7^2 = 49$

Remember the inverse of a function?

Find the inverse of $y = \log_5 x$

→ Step 1: Switch x and y.

$$y = \log_5 x$$

$$x = \log_5 y$$

Step 2: Rewrite as an exponential equation.

$$5^x = y$$

HOMEWORK 8.3

p. 450 #7-25 odd, 53-61 odd,
64-66 and 70-72

WARM UP Evaluate:

1) $\log_2 16 = X$
 $2^X = 16$

2) $\log_8 8$

3) $\log_2 \frac{1}{4} = X$
 $2^X = \frac{1}{4}$

$X = -2$

4) $\log_{\frac{1}{2}} \frac{1}{2}$

5) $\log \frac{1}{1000} = X$
 $10^X = \frac{1}{1000}$

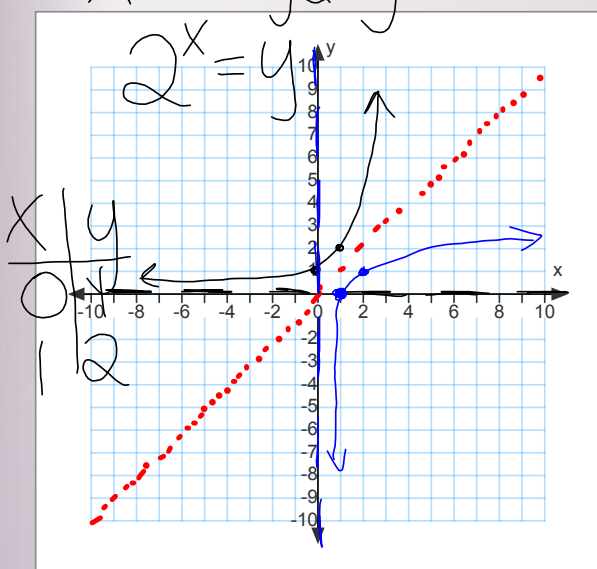
6) $\log_{81} 9$ $X = -3$

8.3 Graphing Logarithmic Functions

A **Logarithmic Function** is the inverse of an exponential function

$$x = \log_2 y$$

$$2^x = y$$



Graph $y = \log_2 x$

By the definition of log,
 $y = \log_2 x$
 is the inverse of $y = 2^x$

Asymptote is the x-axis in $y = 2^x$
 so what is the asymptote of
 $y = \log_2 x$?

$$(1, 0) \quad (b, 1)$$

x	y
1	0
2	1

Domain and Range?

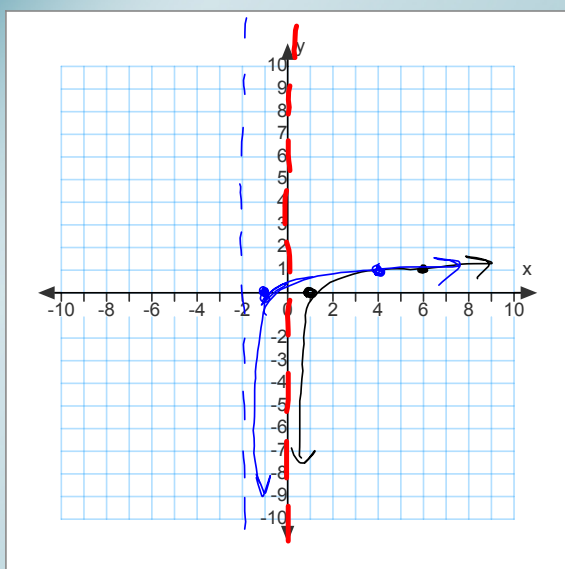
$$D: (-\infty, \infty)$$

$$R: (0, \infty)$$

$$D: (0, \infty)$$

$$R: (-\infty, \infty)$$

Graph $y = \log_6 (x + 2)$



$$(1, 0) \quad (b, 1)$$
$$(6, 1)$$

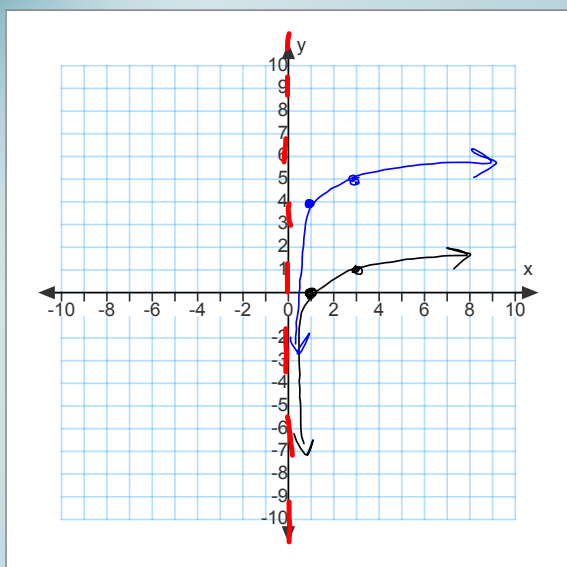
$$y = \log_6 x$$

Domain and Range?

$$D: (-2, \infty)$$

$$R: (-\infty, \infty)$$

Graph $y = \log_3(x) + 4$



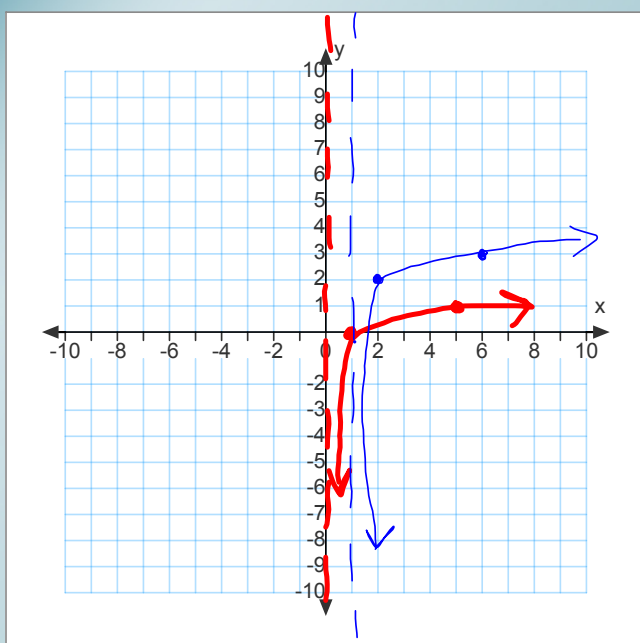
$(1, 0)$ $(b, 1)$
 $(3, 1)$

Domain and Range?

$D: (0, \infty)$
 $R: (-\infty, \infty)$

Graph $y = \log_5(x - 1) + 2$

$(1, 0)$ $(5, 1)$



Domain and Range?

$D: (1, \infty)$ $R: (-\infty, \infty)$

HW 8.3 Part 2
p. 450
6- 24 even
35-40 all on graph paper!
#77-83 odd