

Before we begin, are there any questions from last day's work?

p. 338 # 4, 6, 7

Today's Learning Goal(s):

By the end of the class, I will be able to:

- a) draw upon prior knowledge of exponential functions
- b) make connections between related logarithmic and exponential equations through investigation

Collect Homework (with name at top) from:

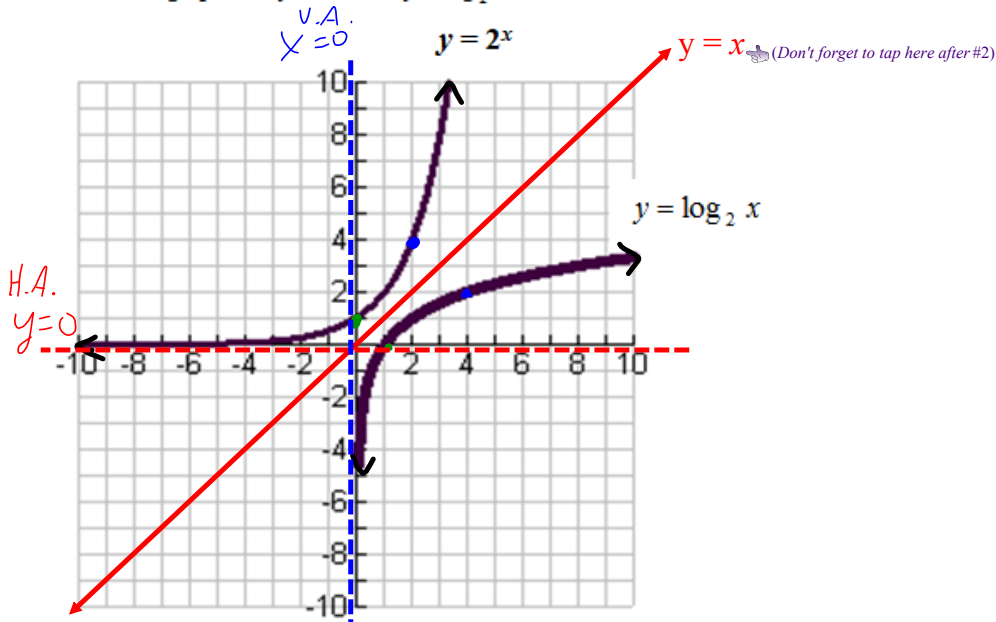
[1.4.1] pp. 329-331 # 7, 11, 2, 4, 5

[1.5.1] Worksheet 1.5.3
p.387 #1, 2a, 3a, 5, 6

1.7.2: Connections Between Logarithmic and Exponential Equations

Date: Sept. 14/18

Consider the graphs of $y = 2^x$ and $y = \log_2 x$.



1. Using the graphs of $y = 2^x$ and $y = \log_2 x$ complete the following tables of values.

x	$y = 2^x$
0	1
2	4
3	8

x	$y = \log_2 x$
1	0
4	2
8	3

2. What relationship exists between $y = 2^x$ and $y = \log_2 x$? Explain your findings.

☞ They are inverse functions.

$$(x, y) \Rightarrow (y, x)$$

☞ Ex (0, 1) maps to (1, 0)

☞ (4, 2) maps to (2, 4) (see the graph)

3a) If $x = 5$, evaluate $y = 2^x$.

☞ $y = 2^5$

∴ $y = 32$

∴ $32 = 2^5$ *last*

b) If $x = 32$, evaluate $y = \log_2 x$.

☞ $y = \log_2 32$

∴ $y = 5$

∴ $5 = \log_2 32$

4. For each function noted below, determine the logarithmic equation.

$$y = 3^x$$

$$\text{👉 } \log_3 y = x$$

$$y = 5^x$$

$$\text{👉 } \log_5 y = x$$

$$y = 11^x$$

$$\text{👉 } \log_{11} y = x$$

5. For each function noted below, determine the exponential function.

$$y = \log_4 x$$

$$\text{👉 } x = 4^y$$

$$y = \log_8 x$$

$$\text{👉 } x = 8^y$$

$$y = \log_{11} x$$

$$\text{👉 } x = 11^y$$

6. If you were asked to solve $3^x = 10$, how might you use the corresponding logarithmic equation to help you solve the equation? What other strategy would you consider using?

$$\text{👉 } \log_3 10 = x$$

Other Strategies

👉 Trial and Error (Systematic Trial)

$$\text{👉 } 3^2 = 9$$

$$3^3 = 27$$

$$\therefore x \doteq 2.\underline{\quad}$$

👉 Intersection Method

$$\text{👉 } y_1 = 3^x \quad y_2 = 10$$

1.7.3 Coach and Be Coached

Date: _____

Instructions: One of you is partner A and the other is partner B.

Go through each row by having partner A coach partner B by using appropriate math terms and procedures.

Switch roles and continue through the entire set of questions.

A coaches B	B coaches A
If $x=64$, evaluate $y=\log_2 x$. $\Rightarrow y = \log_2 64$ so, $2^y = 64$ $\therefore y = \Rightarrow$	If $x=81$, evaluate $y=\log_3 x$. $\Rightarrow y = \log_3 81$ so, $3^y = 81$ $\therefore y = \Rightarrow$
For the function $y=6^x$, determine the logarithmic equation. $\Rightarrow \log_6 y = x$ or $x = \log_6 y$	For the function $y=8^x$, determine the logarithmic equation. $\Rightarrow \log_8 y = x$ or $x = \log_8 y$
For the function $y=\log_7 x$, determine the exponential equation. $\Rightarrow x = 7^y$	For the function $y=\log_9 x$, determine the exponential equation. $\Rightarrow x = 9^y$
Solve $3^x = 32$. (round to 2 decimal places) $\Rightarrow x \doteq 3.16$	Solve $2^x = 20$. (round to 2 decimal places) $\Rightarrow x \doteq 4.32$

Short cuts = "Laws of Logarithms"

Ex. 1 If $b^x = a$
and $x = \log_b a$
then $x = \frac{\log a}{\log b}$

Ex. 2 If $2^x = 32$
and $x = \log_2 32$
then $x = \frac{\log 32}{\log 2}$
 $x = 5$ (check)
 $2^5 = 32$

Ex. 3 If $3^x = 32$ (round to 3 decimal places)
and $x = \log_3 32$
then $x = \frac{\log 32}{\log 3}$
 $x \doteq 3.1546$
 $x \doteq 3.155$ (check)
 $3^{3.155} \doteq 31.977$
 $\doteq 32$

Now solve #6 from 1.7.2 $3^x = 10$ (round to 3 decimal places)

First, convert the equation to logarithmic form. $x = \log_3 10$

② Apply the law of logs

③ $x = \frac{\log 10}{\log 3}$

④ Use a scientific calculator to evaluate

⑤ $\doteq 2.0959$
 $\doteq 2.096$

Note: the "Log" key by itself is base 10

i.e. $\log 1000 = 3$; $\log 100 = 2$; $\log 0.1 = -1$;
 $\log_{10} 1000 = 3$
 $\therefore 10^3 = 1000$

Review the learning goals. Were we successful today?

Homework: p. 344 # 7, 10(a,b), 11