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 equation through investigation

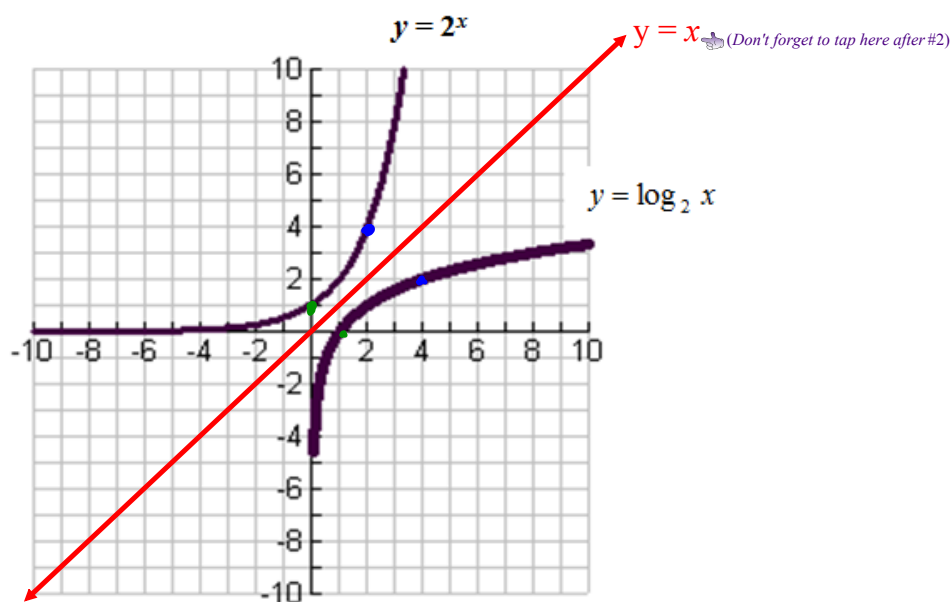Note: If 1.6.3 "Breaking Logs" activity was not completed yesterday, begin today's lesson with it.

Done Spring 2017

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: **Feb. 16/17**

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

$y = 2^x$

$y = x$ (Don't forget to tap here after #2)

$y = \log_2 x$

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 $y = 2^x$.

☞ $y = 2^5$

$\therefore y = 32$ ☞

$\because 32 = 2^5$ ☞ *last*

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

☞ $y = \log_2 32$

$\therefore y = 5$ ☞

$\because 5 = \log_2 32$ ☞

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

$y = 3^x$ $y = 5^x$ $y = 11^x$

☞$\log_3 y = x$ ☞$\log_5 y = x$ ☞$\log_{11} y = x$

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

$y = \log_4 x$ $y = \log_8 x$ $y = \log_{11} x$

☞$x = 4^y$ ☞$x = 8^y$ ☞$x = 11^y$

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?

☞$\log_3 10 = x$ *Other Strategies*
          ☞Trial and Error (Systematic Trial)

          ☞$3^2 = 9$ ☞ Intersection Method
          $3^3 = 27$ ☞ $y_1 = 3^x$ $y_2 = 10$
          $\therefore x \doteq 2.\underline{\quad}$

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

Short cuts = "Laws of Logarithms"

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

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

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

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

First, convert the equation to logarithmic form. $x = \log_3 10$ ☞ ①

② ☞ Apply the law of logs

③ ☞ $x = \dfrac{\log 10}{\log 3}$

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. $\log 1000 = 3$; $\log 100 = 2$; $\log 0.1 = 1$;
  ☞ $\log_{10} 1000 = 3$
  $\because 10^3 = 1000$

Review the learning goals. Were we successful today?
Homework: p. 344 # 7, 10(a,b), 11

Answer any remaining homework questions
Students ask for "at desk" clarification.

10.
a) Express 7 as a power of 3.

$$3^x = 7$$