Today's Learning Goal(s):

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

a) activate prior knowledge of exponential functions

b) determine through investigation with a graphing calculator,
the impact of changing the base on the graph of an exponential equation

c) determine through investigation with a graphing calculator,
the impact of changing the sign of the exponent
on the graph of an exponential equation

Unit 1: Exponential Functions

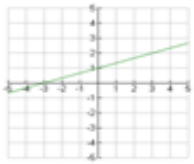
1.1.1 Do You Remember When?

Date: Feb. 6/18

Anticipation Guide

Instructions:

- Compare your choice and explanation with a partner.
- Revisit your choices at the end of the task.
- Compare the choices that you would make *after* the task with the choices that you made before the task.

Before		Statement	After	
Agree	Disagree		Agree	Disagree
7	11	1. All of the following are functions. i. $x = y^2$ ii. $y = 2x^2 - 5$ iii. $y = \frac{x}{4} + 7$ iv. $y = 3^x$ v. $2x + 3y - 5 = 0$		✓
2	16	2. The base of $y = 2^x$ is x.		✓
4	13	3. Audrey is paid $10/hour. The growth of her earnings over the week is an example of exponential growth.		✓
2	17	4. $y = 3^x$ is the same as $y = x^3$.		✓
2	13	5. The area, y, of a square floor with one side measuring x can be modelled by the equation $y = 2^x$		✓
7	12	6. If x = 0 in the relation $y = 5^x$, then y = 0.		✓
16	2	7. For the function on the grid, the x-intercept is -3 and the y-intercept is 1. 	✓	
15	3	8. $y = \left(\frac{1}{5}\right)^x$ is an exponential function.	✓	
12	7	9. The domain of $y = 2^x$ is $\{x \in R\}$	✓	
9	10	10. The range of $y = 10^x$ is $y > 0$.	✓	

1.1.2 The Graphs of Exponential Functions

Date: _____

Step 1:

- Set your graphing calculator to the following window settings.

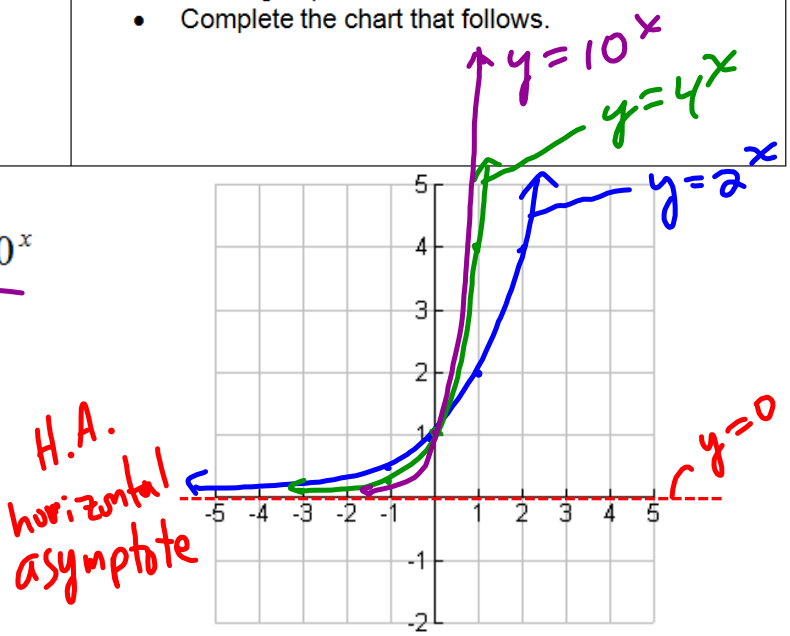
```
WINDOW
 Xmin=-5
 Xmax=5
 Xscl=1
 Ymin=-2
 Ymax=5
 Yscl=1
 Xres=1
```

Step 2:

- Each of the equations is in the form: $y = b^x$
- For each part of the investigation graph the given equations on the same axes. Sketch the graphs on the grid provided.
- Complete the chart that follows.

Part 1:

$y = 2^x$ $y = 4^x$ $y = 10^x$



$y = 2^x$	$y = 4^x$	$y = 10^x$
y-intercept is 1	y-intercept is 1	y-intercept is 1
x-intercept is None	x-intercept is None	x-intercept is None
function is increasing, decreasing or neither (circle one)	function is increasing, decreasing or neither (circle one)	function is increasing, decreasing or neither (circle one)
Domain is:	Domain is:	Domain is:
Range is:	Range is:	Range is:

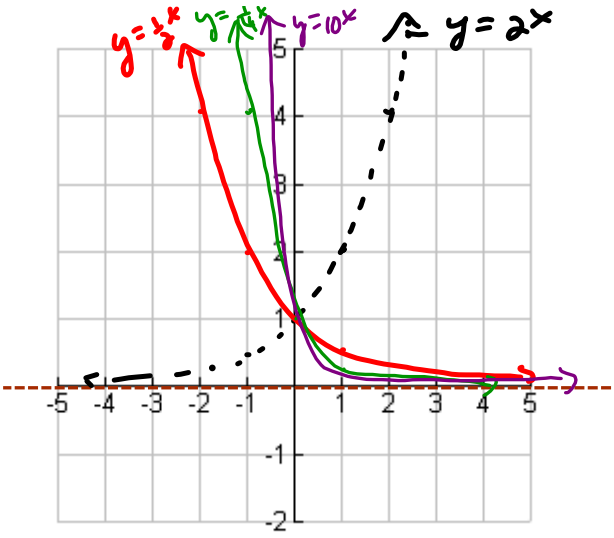
1. Describe what these graphs have in common.
   - Same y-intercept (zero exponent rule)
   - all are increasing (up to the right)
   - y>0, ∴ y=0 (the x-axis) is a horizontal asymptote

2. Describe the impact of changing the base on the graph of an exponential function.
   - As "b" increases, the function increases more quickly

Part 2:

$y = 2^x$ $y = \left(\frac{1}{2}\right)^x$ $y = \left(\frac{1}{4}\right)^x$ $y = \left(\frac{1}{10}\right)^x$

(Consider putting brackets around the fractional bases)



$y = \left(\frac{1}{2}\right)^x$	$y = \left(\frac{1}{4}\right)^x$	$y = \left(\frac{1}{10}\right)^x$
y-intercept is 1	y-intercept is 1	y-intercept is 1
x-intercept is none	x-intercept is none	x-intercept is none
function is increasing, decreasing or neither (circle one)	function is increasing, decreasing or neither (circle one)	function is increasing, decreasing or neither (circle one)
Domain is:	Domain is:	Domain is:
Range is:	Range is:	Range is:

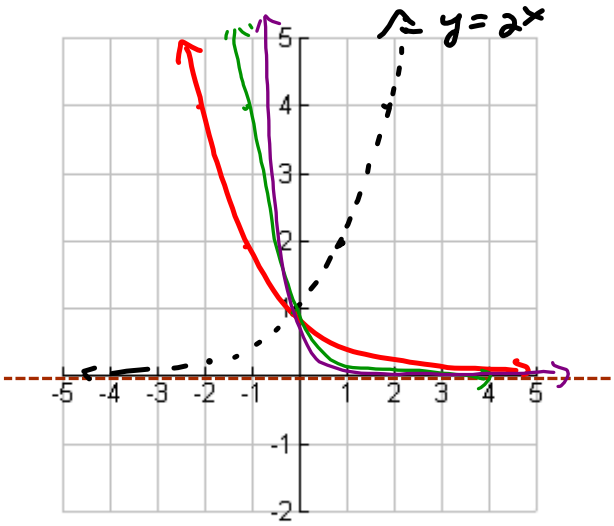
3. Describe what these graphs have in common.
   - Same y-intercept (zero exponent rule)
   - all are decreasing (down to the right)
   - $y>0$, ∴ $y=0$ (the x-axis) is a horizontal asymptote

4. Describe the impact of changing the base on the graph of an exponential function.
   - When $0 < b < 1$, decreasing the base has the function decrease more quickly

Part 3:

$y = 2^x$ $y = 2^{-x}$ $y = 4^{-x}$ $y = 10^{-x}$

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



$y = 2^{-x}$	$y = 4^{-x}$	$y = 10^{-x}$
y-intercept is 1	y-intercept is 1	y-intercept is 1
x-intercept is none	x-intercept is none	x-intercept is none
function is increasing, decreasing or neither (circle one)	function is increasing, decreasing or neither (circle one)	function is increasing, decreasing or neither (circle one)
Domain is: $\{x \in R\}$	Domain is: $\{x \in R\}$	Domain is: $\{x \in R\}$
Range is: $\{y \in R / y > 0\}$	Range is: $\{y \in R / y > 0\}$	Range is: $\{y \in R / y > 0\}$

5. Describe what these graphs have in common with the graphs in part 2.

- They represent the same functions. (due to the negative exponent rule)
- $y = 2^{-x}$

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

6. Describe the impact of changing the sign of the exponent on the graph of an exponential function.

- Changing the sign of the exponent changes an exponential function from increasing (growth) to decreasing (decay), or vice versa.