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 graphing software (desmos) the impact of changing the base on the graph of an exponential function.

c) determine through investigation with graphing software, the impact of changing the sign of the exponent on the graph of an exponential function.

Unit 1: Exponential Functions

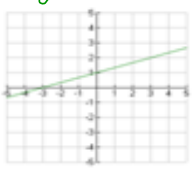
1.1.1 Do You Remember When?

Date: Sept. 5/18

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.

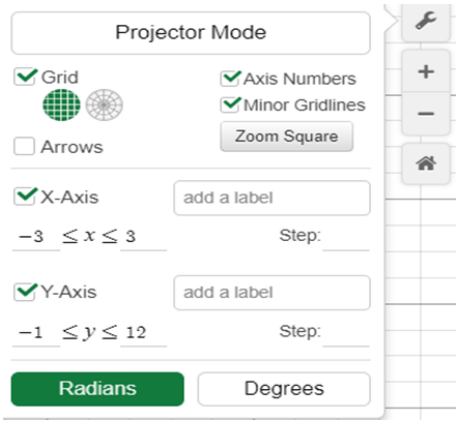
Before		Statement	After	
Agree	Disagree		Agree	Disagree
10	2	1. All of the following are functions. i. $x=y^2$ ✗ ii. $y=2x^2-5$ ✓ iii. $y=\frac{x}{4}+7$ ✓ iv. $y=3^x$ ✓ v. $2x+3y-5=0$ ✓ (NOT function)	13	0 ✓
0	12	2. The base of $y=2^x$ is x.	0	13 ✓
4	8	3. Audrey is paid $10/hour. The growth of her earnings over the week is an example of exponential growth. (linear)	0	13 ✓
0	12	4. $y=3^x$ is the same as $y=x^3$.	0	13 ✓
0	10	5. The area, y, of a square floor with one side measuring x can be modelled by the equation $y=2^x$ (↳ $y=x^2$)	0	13 ✓
2	11	6. If x = 0 in the relation $y=5^x$, then y = 0.	0	13 ✓
6	6	7. For the function on the grid, the x-intercept is -3 and the y-intercept is 1.  (y = 1)	3 ✓	10
9	2	8. $y=\left(\frac{1}{5}\right)^x$ is an exponential function.	13 ✓	0
10	2	9. The domain of $y=2^x$ is $\{x \in R\}$	13 ✓	0
5	7	10. The range of $y=10^x$ is $\{y \in R / y>0\}$.	3 ✓	10

1.1.2 The Graphs of Exponential Functions

Date: Sept. 5 / 18

Step 1:

Using desmos, adjust to the following window settings.



Step 2:

Each of the equations is in the form: $y = b^x$

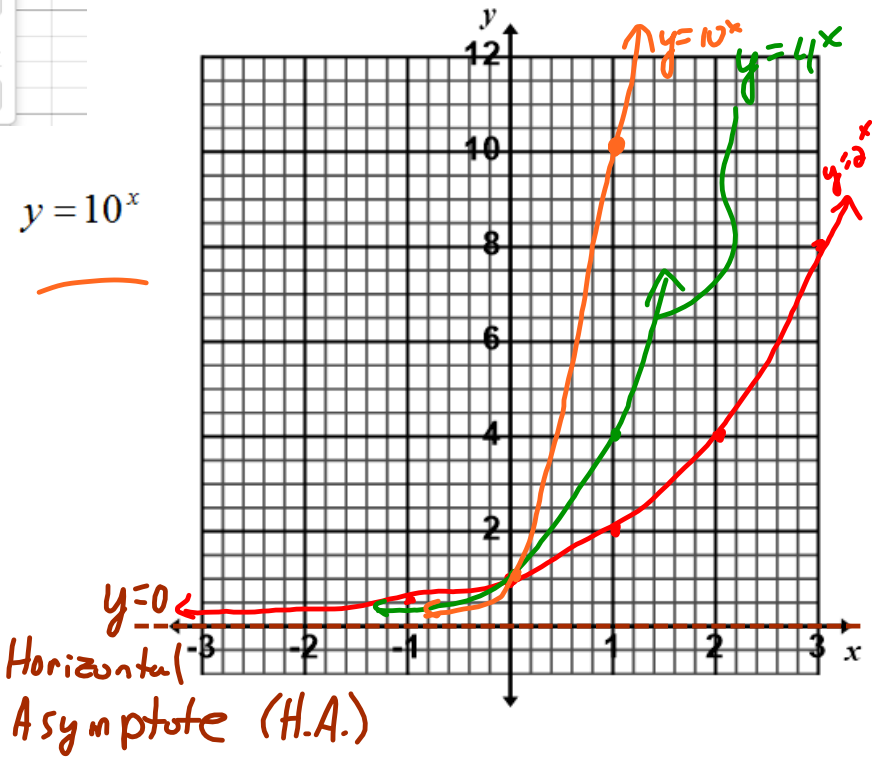
For each part of the investigation graph the given equations on the same axes.

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: $\{x \in R\}$	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: $\{y \in R / y > 0\}$

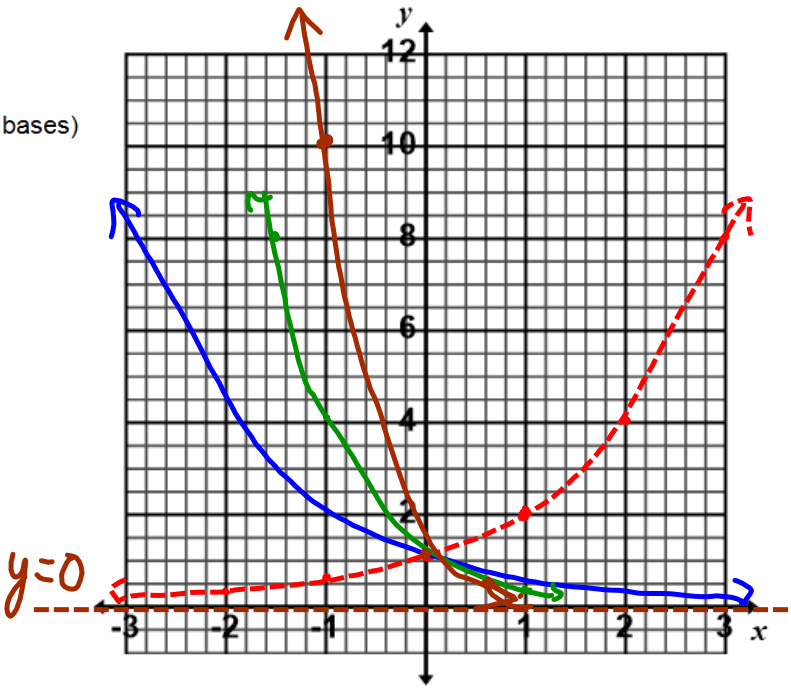
1. Describe what these graphs have in common.
   - Same y-intercept (zero exponent rule)
   - all are increasing (up to the right)
   - y>0, ∴ y=0 (the x-axis) is a horizontal asymptote

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)



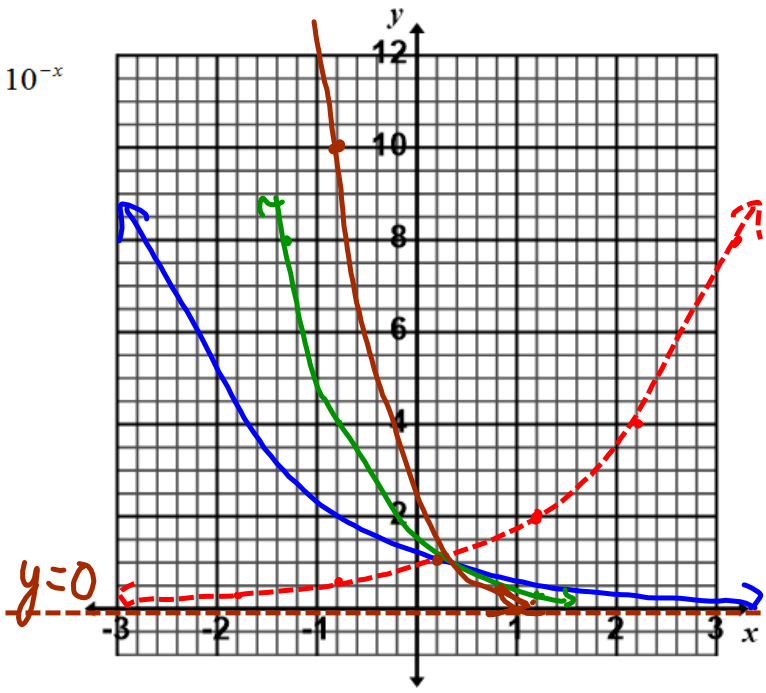
$y = \left(\frac{1}{2}\right)^x$	$y = \left(\frac{1}{4}\right)^x$	$y = \left(\frac{1}{10}\right)^x$
y-intercept is 1 x-intercept is NONE function is increasing, decreasing or neither (circle one) Domain is: $\{x \in R\}$ Range is: $\{y \in R / y > 0\}$	y-intercept is 1 x-intercept is NONE function is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

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:

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



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

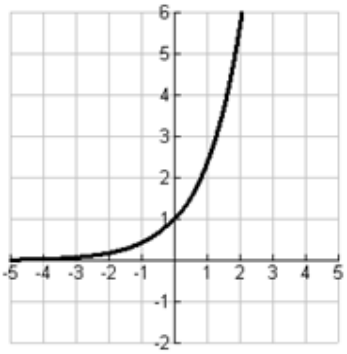
Changing the sign of the exponent changes an exponential function from increasing (growth) to decreasing (decay), or vice versa.

1.1.3 Matching Activity

Date: _____

Match each graph with an equation that best represents the relationship.
For each graph, state the x-intercept, y-intercept, domain, range, and whether the graph is increasing, decreasing or neither.

Equations: i) $y = 3^{-x}$ ii) $y = \left(\frac{1}{4}\right)^{x}$ iii) $y = 5^{-x}$ iv) $y = 2.4^{x}$ v) $y = 5.5^{x}$ vi) $y = 3.4^{x}$



a) Equation:

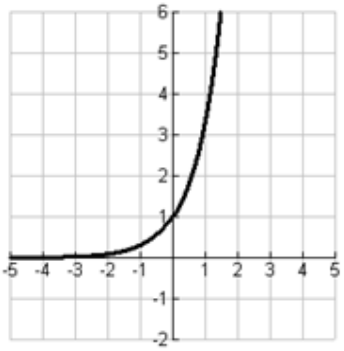
y-intercept is

x-intercept is

function is increasing, decreasing or neither (circle one)

Domain is:

Range is:



b) Equation:

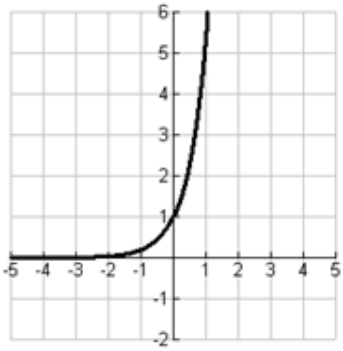
y-intercept is

x-intercept is

function is increasing, decreasing or neither (circle one)

Domain is:

Range is:



c) Equation:

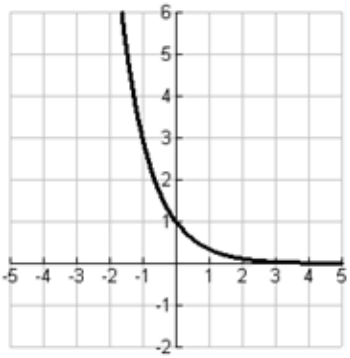
y-intercept is

x-intercept is

function is increasing, decreasing or neither (circle one)

Domain is:

Range is:



d) Equation:

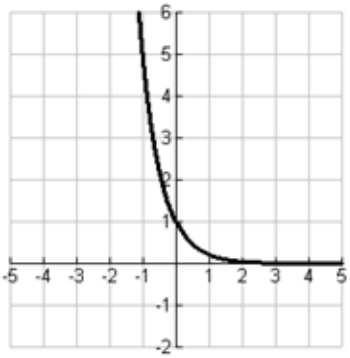
y-intercept is

x-intercept is

function is increasing, decreasing or neither (circle one)

Domain is:

Range is:



e) Equation:

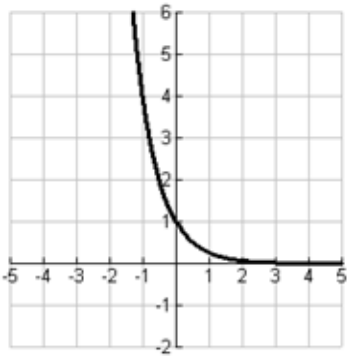
y-intercept is

x-intercept is

function is increasing, decreasing or neither (circle one)

Domain is:

Range is:



f) Equation:

y-intercept is

x-intercept is

function is increasing, decreasing or neither (circle one)

Domain is:

Range is: