Geometry Lomac 2015-2016	Date 11/16 due 11/17	Exponential Functions Day 1 5.3L

Name _____ **Per**_____

LO: I can solve problems involving exponential growth and decay – including writing equations.

emath 6.4

☐ **DO NOW**   On the back of this packet

☐ **(1)**   **Exponential Functions: Graphing**

So far we have concentrated on **linear functions** which are characterized by having a **constant rate of change**. In the last lesson, we looked at **exponential growth and decay**. In this lesson we will more formally introduce the concept of an **exponential function**.

Exercise #1: Consider the exponential function $f(x) = 8(2)^x$. Answer the following.

(a) Evaluate each of the following and indicate what point must lie on the graph of $f(x)$ based on each:
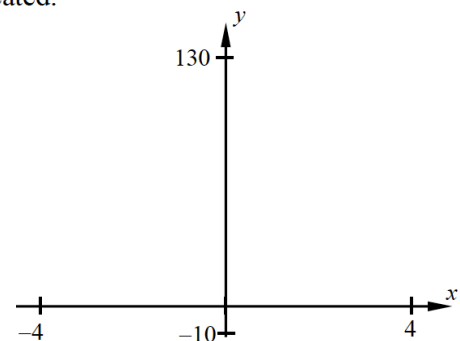
(i) $f(2) =$ (ii) $f(0) =$ (iii) $f(-1) =$

(b) Calculate the average rate of change of f over the interval $-1 \le x \le 0$.

(c) Calculate the average rate of change over the interval $0 \le x \le 2$.

(d) What does comparing answers from (b) and (c) tell you about this function? Explain.

(e) Using your calculator, draw a sketch of this function on the axes below using the window indicated.

☐ (3) **Need to Know: Exponential Functions**

Exponential functions are all about **multiplication**. The basic form of an exponential function is given below.
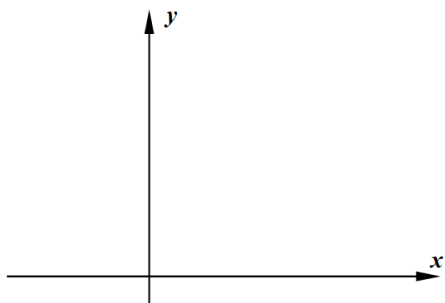

EXPONENTIAL FUNCTIONS

A general exponential function has the form: $y = a(b)^x$, where a is the **y-intercept** and b is the **base** or **multiplying factor**. Sometimes b is known as the **growth factor**.

☐ (3) **Exponential Functions**

Let's work some more with exponential functions to develop a better sense for them.

Exercise #2: Consider the function $g(x) = 54\left(\dfrac{1}{3}\right)^x$.

(a) Evaluate $g(0)$. What point does this indicate on the graph of g?

(b) Without the use of your calculator, determine the values of $g(1)$ and $g(2)$.

(c) Using your graphing calculator, sketch a graph of this function using the **WINDOW** $-2 \le x \le 4$ and $-10 \le y \le 100$. Mark the y-intercept.

(d) Why is this exponential function always **decreasing** while the one in Exercise #1 is always increasing?

INCREASING VS. DECREASING EXPONENTIALS

$y = a(b)^x$ will **increase** if _____

$y = a(b)^x$ will **decrease** if _____

☐ (4)   **Exponential Functions**

***Exercise* #4:** Find the equation of the exponential function, in $y = a(b)^x$ form, for the function given in the table below. Show or explain your thinking.

x	0	1	2	3	4
y	10	30	90	270	810

☐ **(5)** **Exit Ticket**

ON THE LAST PAGE

☐ **(6)** **Homework**
cont.

FLUENCY

1. Consider the exponential function $f(x) = 10(2)^x$.

   (a) Find the value of $f(0)$. What point does this represent on the graph of $y = f(x)$?

   (b) Is this an increasing or decreasing exponential function? How can you tell based on its equation?

   (c) Is this function's average rate of change over the interval $-1 \le x \le 2$ greater or less than that of the linear function $g(x) = 10x + 7$? Justify.

   (d) Using your calculator, sketch a graph of this function on the axes shown below. Use the window indicated. Mark the y-intercept.
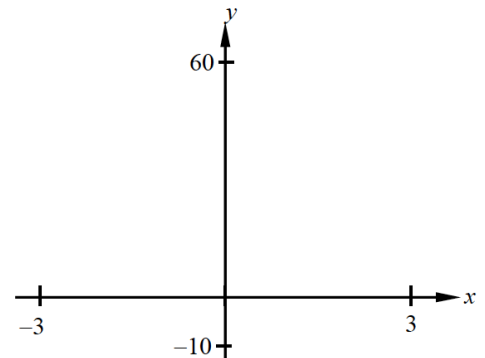
2. Which of the following is a decreasing exponential function whose y-intercept is 20?

   (1) $y = 20\left(\dfrac{4}{3}\right)^x$ (3) $y = -2x + 20$

   (2) $y = 20\left(\dfrac{1}{2}\right)^x$ (4) $y = \left(\dfrac{1}{3}\right)^x + 20$

3. Which of the following functions would best describe the data in the table?

   (1) $y = 10x + 2$ (3) $y = 5(2)^x$

   (2) $y = 8x + 2$ (4) $y = 2(5)^x$

x	0	1	2	3	4
y	2	10	50	250	1250

Exit Ticket   Name_____ **Date** _____ _____ **Per_** _____   **5.3L**

The LO (Learning Outcomes) are written below your name on the front of this packet. Demonstrate your achievement of these outcomes by doing the following:

(1) For each of the following exponential functions, give its y-intercept and tell whether it is increasing or decreasing. Explain how you know.

(a) $y = 8\left(\dfrac{2}{3}\right)^x$

(b) $f(x) = 125(1.5)^x$

(c) $P(t) = 56\left(\dfrac{3}{2}\right)^t$

DO NOW   Name_____ Date _____ Per_____   5.3L

(1) Translation to algebra progress. Write one or more algebraic statement(s) to represent this situation. Be sure to write at least one "Let" statement to define any variables.

Jonah is going to the store to buy candles. Small candles cost $3.50 and large candles cost $5.00. He needs to buy at least 20 candles, and he cannot spend more than $80. Write a system of linear inequalities that represent the situation.