Geometry Lomac 2015-2016 **Date** 1/4 **due** 1/5 **Quadratics 7.1L**

Name ________________________________ **Per**______

LO: I can describe key features of quadratic functions using tables and graphs.

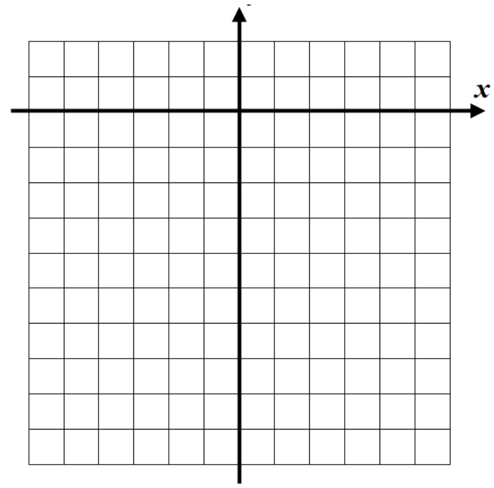
emath 8.2

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

☐ (1) **Quadratics and turning points**

Graph the function y = x^2. What is the range of this quadratic? ______________________________

x	$y=-x^2$	(x, y)
-3		
-2		
-1		
0		
1		
2		
3		



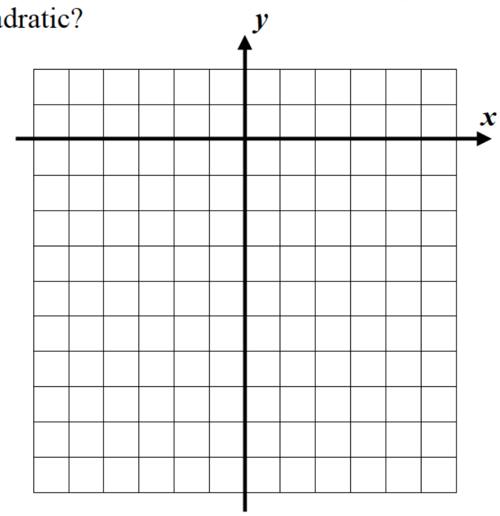
The graphs of quadratic functions are more complex than linear and exponential because they include a **turning point** that is either the location of a **maximum** or a **minimum**. Today we will explore these functions more by using our calculator technology. But first, we need to examine one additional quadratic function by hand.

***Exercise* #1:** Consider the simple quadratic function $y=-x^2$.

(a) Write this parabola in the form $y=ax^2$, where a is the leading coefficient. Then, fill out the table below.

x	$y=-x^2$	(x, y)
-3		
-2		
-1		
0		
1		
2		
3		

(b) Graph the parabola given in this table on the grid provided. What is the range of this quadratic?



Range:

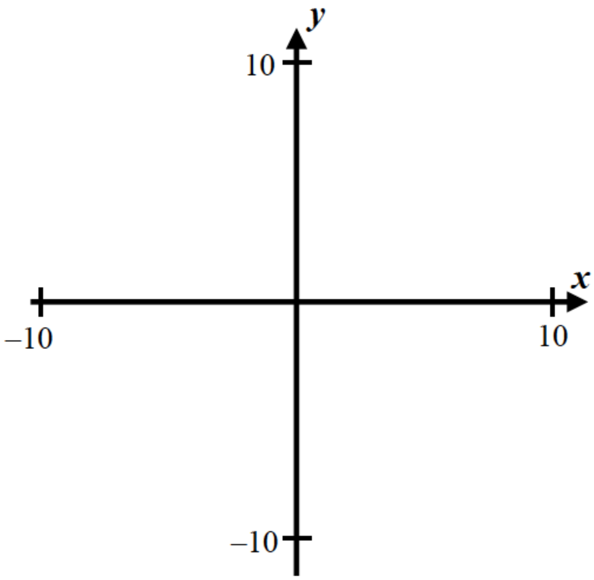
How are the graphs for y = x^2 and y = $-x^2$ alike? Different?

☐ (2) **Quadratics: Concave up and Concave down**

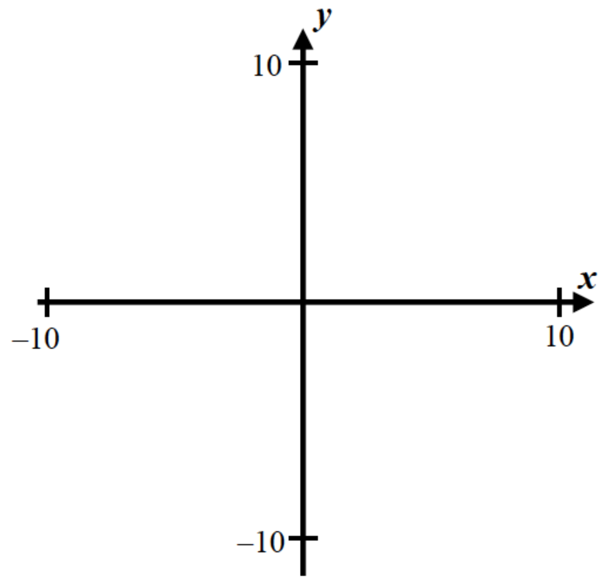
Some parabolas are concave up (open upward) and some are concave down (open downward). Let's see if we can find a pattern that tells us what controls this behavior.

***Exercise* #2:** Use your graphing calculator with a **STANDARD WINDOW** to sketch each of the following.

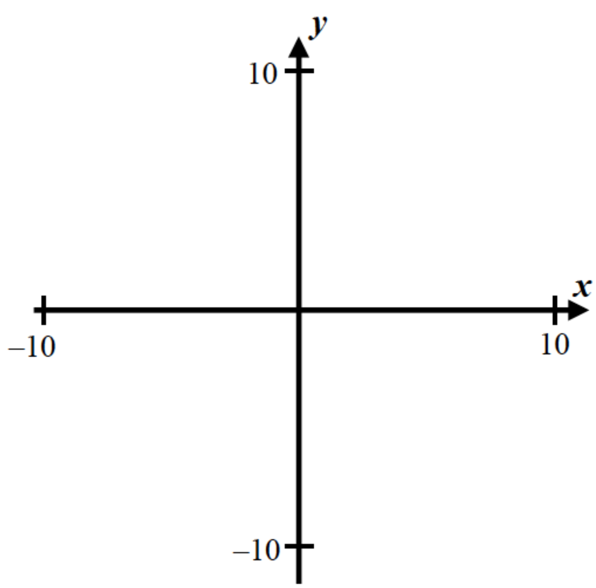
****Label the y-intercept and clearly show at least 2 other points on the graph.**



$y = 3x^2 + 6x - 4$



$y = -x^2 + 6x + 1$

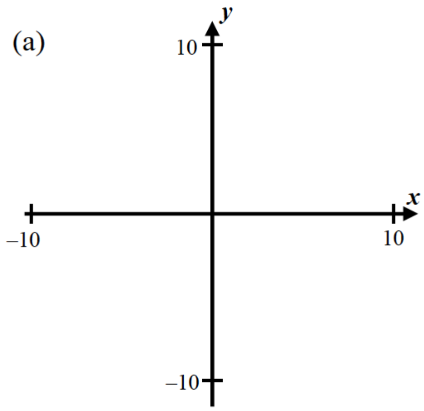


$y = -2x^2 - 8x - 4$

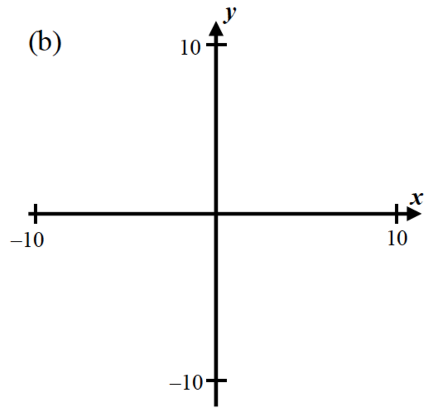
☐ (4) **Predict concave up or down using example graphs**

****Label the y-intercept and clearly show at least 2 other points on the graph.**

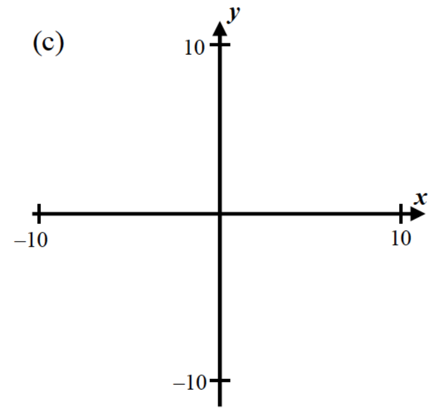
***Exercise* #3:** Use your calculator to sketch a graph of each of the following quadratics using the indicated window.

(a)


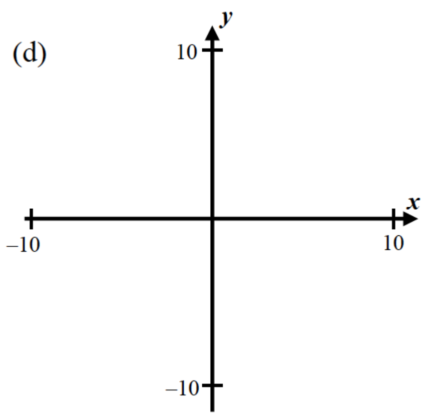
$y = 2x^2$

(b)


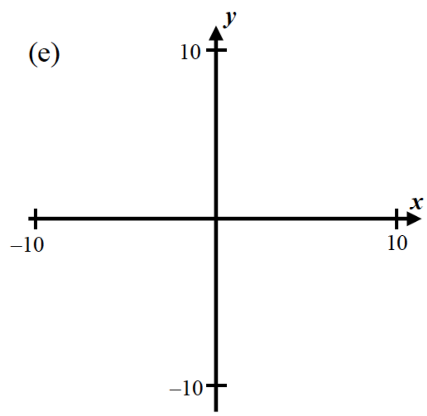
$y = 3x^2$

(c)


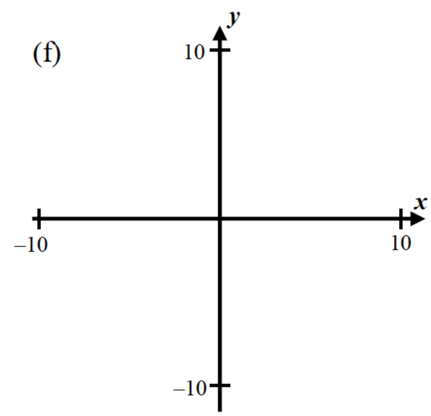
$y = 4x^2$

(d)


$y = -2x^2$

(e)


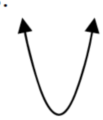
$y = -3x^2$

(f)


$y = -4x^2$

So, it appears that we can now determine what controls the direction a parabola opens.

***Exercise* #4:** For the quadratic $y = ax^2 + bx + c$ fill in the blanks:

(1) The parabola will **open upwards**, in other words look like  if ______________.

This type of quadratic function will have a **minimum y-value.**

(2) The parabola will **open downwards**, in other words look like  if ______________.

This type of quadratic function will have a **maximum y-value**.

☐ (4) **Predict concave up or down using example graphs**

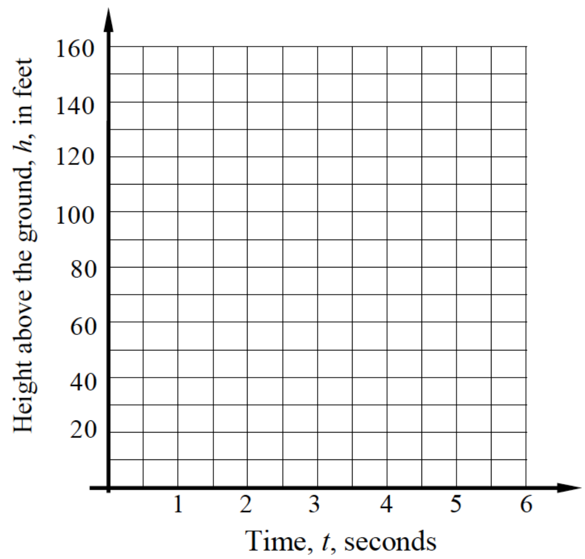
****Label the y-intercept and clearly show at least 2 other points on the graph.**

APPLICATIONS

6. The height of an object that is traveling through the air can be well modeled by a quadratic function that opens downward. An object is fired upward and its height in feet above the ground is given by:

$h(t) = -16t^2 + 64t + 80$ where the input, t, is the time, in seconds, the object has been in the air

(a) Using your calculator, sketch a graph of the object's height for all times where it is at or above the ground.



(b) What is its maximum height in feet?

(c) At what time does it hit the ground?

(d) Over what time interval is its height increasing?

Why does it make sense that an object traveling through the air is modeled with a quadratic function that is concave down?

What does this tell you about the coefficient of x^2?

☐ (4) **Predict concave up or down using example graphs**

7. The cost per computer produced at a factory depends on how many computers the factory produces in a day. The cost function is modeled by $C(n)=\frac{1}{500}n^2-n+200$, where n is the number of computers produced in

(a) Calculate $C(50)$ and give an interpretation of your answer in terms of the scenario described.

(b) Does the cost have a minimum or maximum value? Explain. Use your calculator to find it.

(c) Based on (b), can this function have any real zeroes? Explain your thought process.

☐ (6) **Exit Ticket**

ON THE LAST PAGE

☐ (7) **Homework**
cont.

FLUENCY

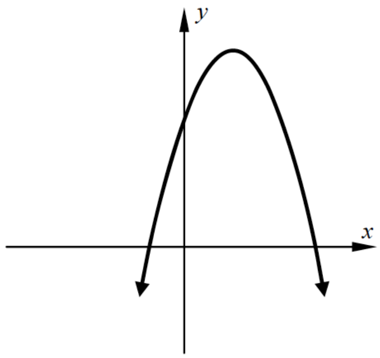
1. Which of the following could be the equation of the quadratic shown below? Explain your reasoning.

(1) $y = -3x^2 + 8x - 5$

(2) $y = 4x^2 - 6x + 7$

(3) $y = -2x^2 + 12x + 11$

(4) $y = x^2 - 8x - 2$



Reasoning:

2. Based on the quadratic function shown in the table below, which of the following is the range of this function?

(1) $y \geq -7$ (3) $y \leq 4$

(2) $y \geq 3$ (4) $y \leq 11$

x	-1	0	1	2	3	4
y	3	9	11	9	3	-7

For Problems 3 – 5, use tables on your calculator to help you investigate these functions.

3. Which of the following quadratics will have a maximum value at $x = 3$?

(1) $y = x^2 - 6x + 19$ (3) $y = -2x^2 + 20x - 49$

(2) $y = -4x^2 + 24x - 21$ (4) $y = 2x^2 - 3x + 7$

4. Which of the following quadratics will have a minimum value of -5 at $x = 7$?

(1) $y = x^2 - 14x + 39$ (3) $y = x^2 - 14x + 44$

(2) $y = -x^2 + 14x - 54$ (4) $y = -x^2 - 10x - 18$

5. The parabola $y = -x^2 + 12x - 11$ has an **axis of symmetry** of $x = 6$. Which of the following represents its range?

(1) $y \geq -11$ (3) $y \leq 6$

(2) $y \leq 25$ (4) $y \geq 10$

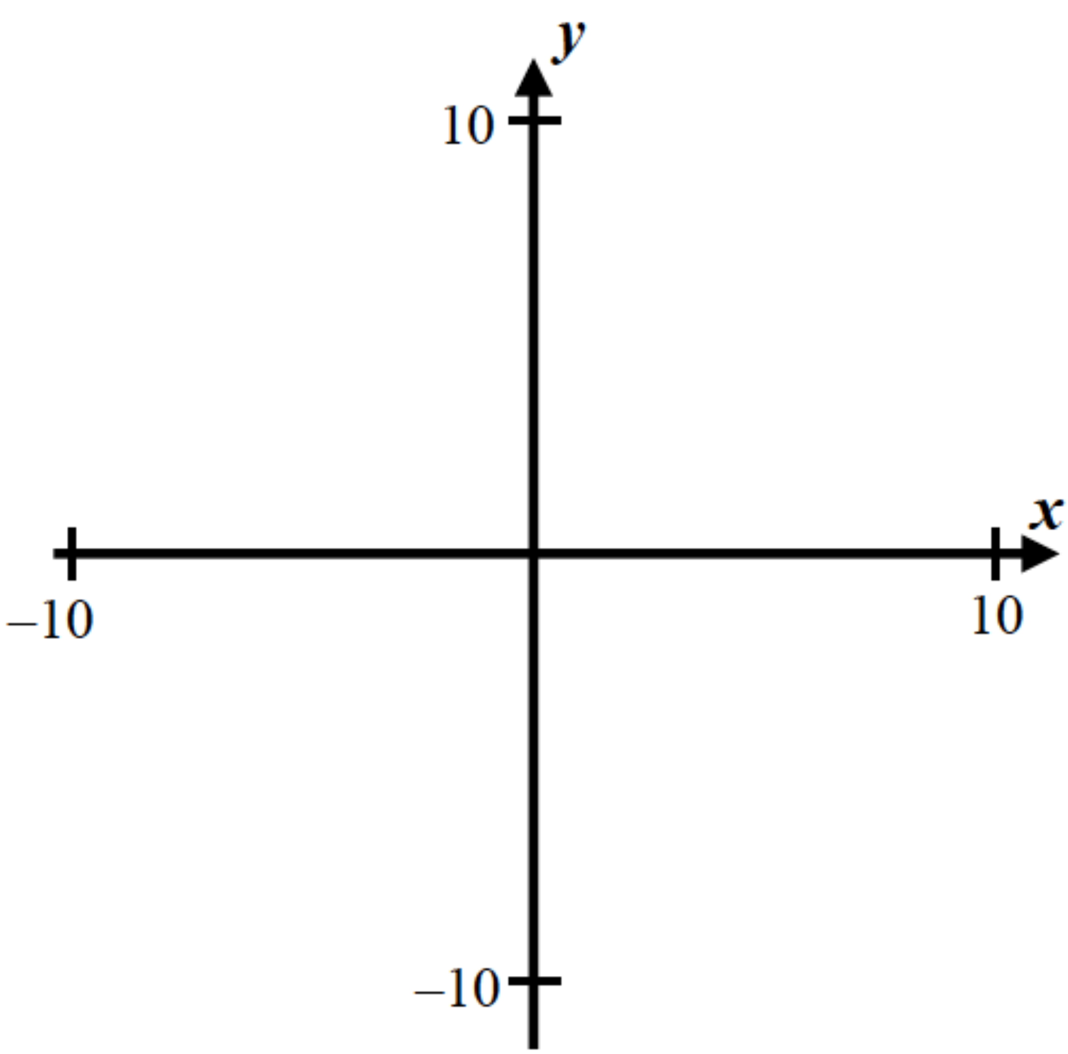
Exit Ticket **Name**__________________________________ **Date** ______ _____ **Per**_ _____ **7.1L**

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) PREDICT whether each quadratic will be concave up or concave down and explain your choice.
(2) Graph both quadratics on the axes below. For each graph, label the y-intercept and mark at least 2 other points.

$g(x) = -2x^2 - 3x + 1$

$h(x) = 3x^2 + 2x - 5$



DO NOW Name________________________________ Date ___________ Per______ 7.1L

(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.

Wolfgang and Heinrich worked as electricians at \$14 and \$12 per hour respectively. One month Wolfgang worked 10 hours more than Heinrich. If their total income for the month was \$3520, how many hours did each work during the month?