Name: ____________________________________ Date: __________________

INTRODUCTION TO QUADRATIC FUNCTIONS
COMMON CORE ALGEBRA I

We have now studied **linear** and **exponential** functions. These functions were relatively simple because they were either **always increasing** or **always decreasing** for their entire **domains.** We now will start to study other functions, most notably **quadratic functions**, which are a type of **polynomial function**. Their definition is shown below:

QUADRATIC FUNCTIONS

Any function that can be placed in the form: $y = ax^2 + bx + c$, where $a \neq 0$, but b and c can be zero.

***Exercise* #1:** Read the definition above for quadratic functions and answer the following questions.

(a) Why is it important for the **leading coefficient** to be nonzero?

(b) Circle the choices below that are quadratic functions.

$y = x^2 - 3$ $\quad$ $y = x^3 + 2x^2 - 4$

$y = x^2 + \sqrt{x} + 7$ $\quad$ $y = 10 - x^2$

(c) Given the quadratic function $y = 10 - 3x^2 + 7x$, write it in standard form and state the value of the leading coefficient.

(d) If $f(x) = 2x^2 - 3x + 1$, then find, without using your calculator, the value of $f(-2)$. What point must lie on this quadratic's graph based on this calculation?

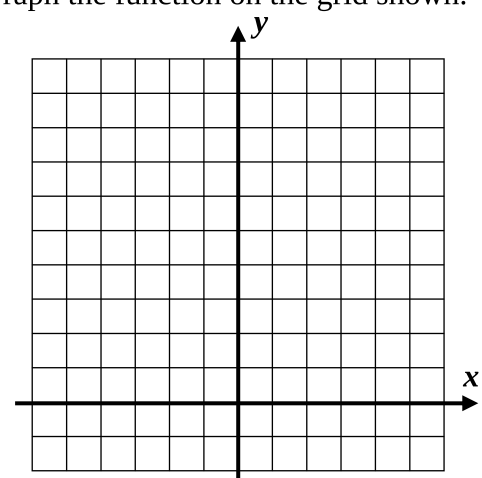
Quadratics still behave in similar ways to other functions. Inputs go in, outputs come out. But, they start to behave differently from **linear** and **exponential** functions because sometimes **outputs repeat** for quadratics.

***Exercise* #2:** Consider the simplest of all quadratic functions, $f(x) = x^2$.

(a) Fill out the table below without using your calculator.

x	−3	−2	−1	0	1	2	3
$y = x^2$							

(b) Graph the function on the grid shown.

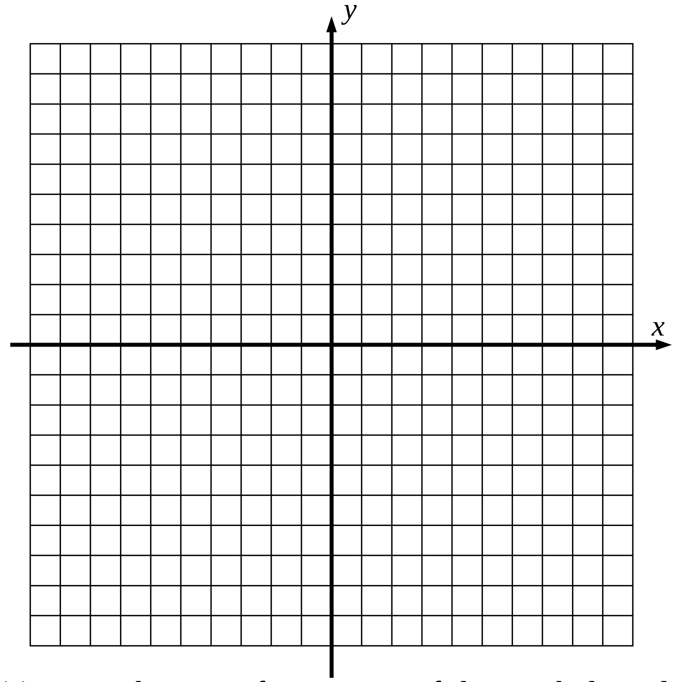


(c) What is the **range** of this quadratic function?

Quadratic functions can obviously be more complicated than our last example, but, strangely enough, they all have the same general shape, which is known as a **parabola**. Let's explore the next quadratic function with the help of technology. We will also introduce some important terminology.

***Exercise* #3:** Consider the quadratic function $y = x^2 - 2x - 8$.

(a) Using your calculator to help generate a table, graph this parabola on the grid given. Show a table of values that you use to create the plot.



(b) State the **range** of this function.

(c) Over what **domain interval** is the function **increasing**?

(d) State the coordinates of the parabola's turning point (also known as its vertex and its minimum point).

(e) Draw the axis of symmetry of the parabola and write its equation below and on the graph.

(f) What are the x-intercepts of this function? These are also known as the function's **zeroes**. Why does this name make sense? As a suggestion, write out their full xy-pair coordinates.

***Exercise* #4:** The quadratic function $f(x)$ has selected values shown in the table below.

(a) What are the coordinates of the turning point?

(b) What is the range of the quadratic function?

x	$f(x)$
−1	4
0	9
1	12
2	13
3	12
4	9
5	4
6	−2

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Introduction to Quadratic Functions
Common Core Algebra I Homework

Fluency

1. Which of the following is a quadratic function?

(1) $y = 3x - 2$ (3) $y = x^2 - 4$

(2) $y = x^3 + 2x^2 - 1$ (4) $y = 6(2)^x$

2. The quadratic function $y = 9 - x^2 + 4x$ written in standard form would be

(1) $y = -x^2 + 4x + 9$ (3) $y = x^2 - 4x + 9$

(2) $y = x^2 - 9x + 4$ (4) $y = -x^2 - 4x + 9$

3. Which of the following would be the leading coefficient of $f(x) = 6 - x + 7x^2$?

(1) -1 (3) 7

(2) 6 (4) -7

4. Which of the following points lies on the graph of $y = x^2 - 5$?

(1) $(3, -2)$ (3) $(5, 0)$

(2) $(-2, -1)$ (4) $(-1, -6)$

5. A quadratic function is partially given in the table below. Which of the following are the coordinates of its turning point?

(1) $(0, 6)$ (3) $(3, 15)$

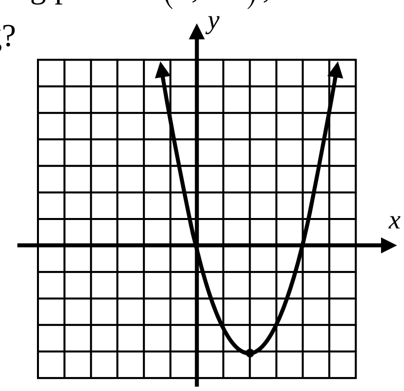
(2) $(10, 2)$ (4) $(7, -1)$

x	–2	–1	0	1	2	3
y	10	7	6	7	10	15

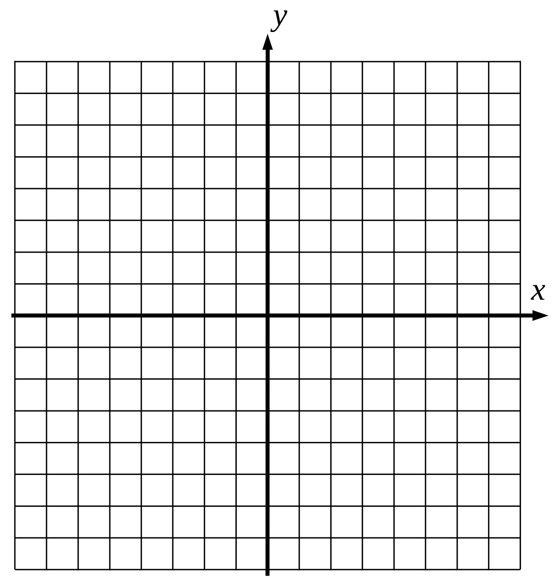
6. Given the quadratic function shown below whose turning point is $(2, -4)$, which of the following gives the domain interval over which this function is decreasing?

(1) $x > -4$ (3) $x > 2$

(2) $x < -4$ (4) $x < 2$



7. Consider the function $f(x) = x^2 + 2x - 3$.



(a) Using your calculator, create an accurate graph of $f(x)$ on the grid provided.

(b) State the coordinates of the turning point of $f(x)$. Is this point a maximum or minimum?

(c) State the range of this quadratic function.

(d) State the **zeroes** of this function (the x-intercepts).

(e) Over what interval is this function **negative**? In other words, over what x-values is the output (or y-value) to this function negative?

(f) Over what interval is this function **increasing**?

(g) Determine the average rate of change of this function over the interval $-2 \le x \le 4$.

REASONING

8. A quadratic function $g(x)$ is shown partially in the table below. The turning point of the function has the coordinates $(3, -8)$. Think about how outputs repeat in a quadratic function and answer the following.

x	−1	0	1	2	3	4	5	6	7
$g(x)$	24		0	−6	−8			10	

(a) Fill in the missing output values from the table.

(b) What are the zeroes of the function?

(c) What is this function's y-intercept?

(d) For the domain interval $-1 \le x \le 7$, what is the range of the function?