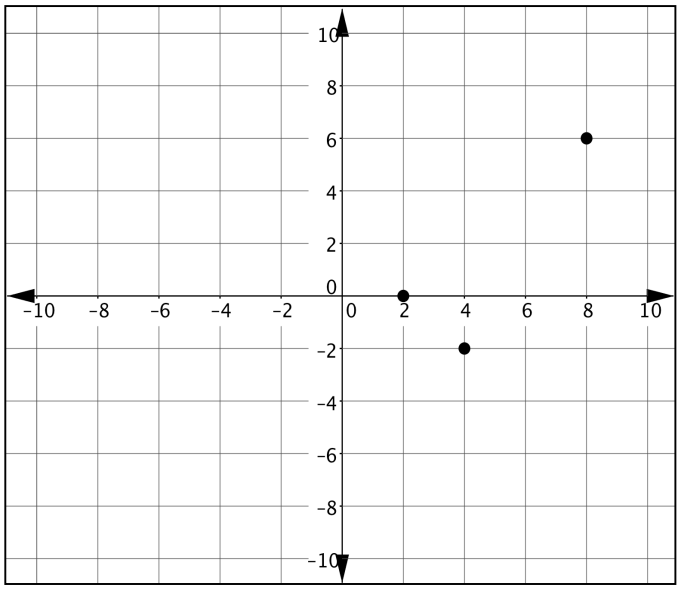
Name _____ Date_____

Quadratic Functions - Part 2
Observations from the Graph of a Quadratic Function
Independent Practice

1. The point $(4, -2)$ is the vertex of the graph of a quadratic function. The points $(8, 6)$ and $(2, 0)$ also fall on the graph of the function. Complete the graph of this quadratic function by first finding two additional points on the graph.



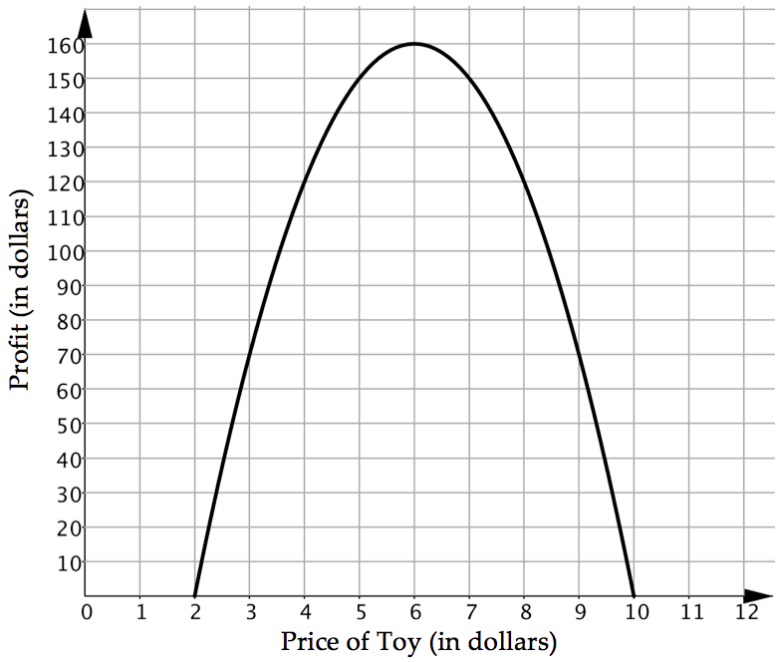
Part A: What is the y-intercept of the graph?

Part B: What are the x-intercepts?

Part C: Find the interval on which the rate of change is always positive.

Part D: What is the sign of the leading coefficient for this quadratic function? How do you know?

2. Toy Universe is manufacturing a new toy and deciding on a price that will result in a maximum profit. The graph below represents profit P generated by each price of a toy x.



Part A: If the company wants to make a maximum profit, what should the price of a new toy be?

Part B: What is the minimum price of a toy that will produce profit for the company? Explain your answer.

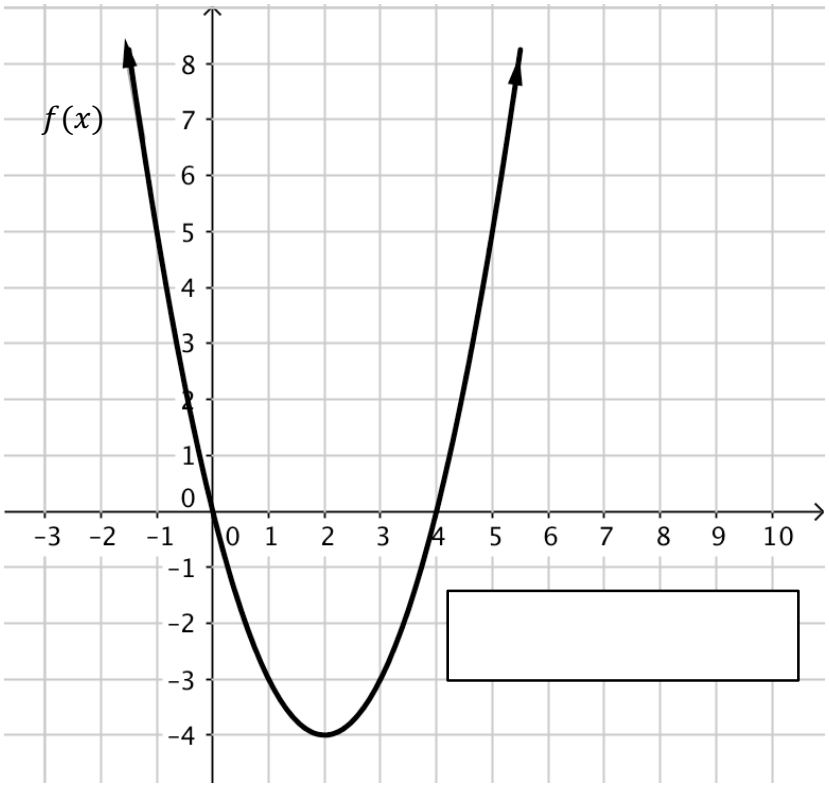
Part C: Estimate the value of $P(10)$and explain what the value means in the problem and how this may be possible.

Part D: If the company wants to make a profit of $\$137$, for how much should the toy be sold?

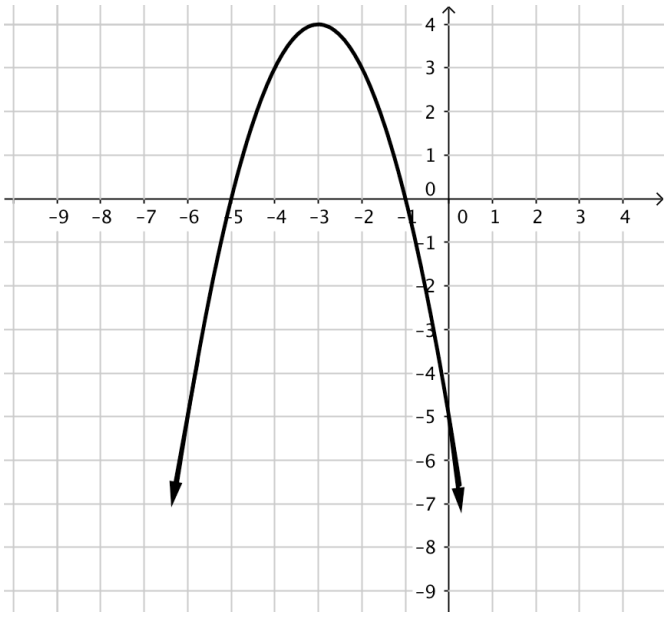
Part E: Find the domain that will only result in a profit for the company and find its corresponding range of profit.

Part F: The company owner believes that selling the toy at a higher price will result in a greater profit. Explain to the owner how selling the toy at a higher price will affect the profit.

3. Write the equation for this graph in the space provided on the graph.



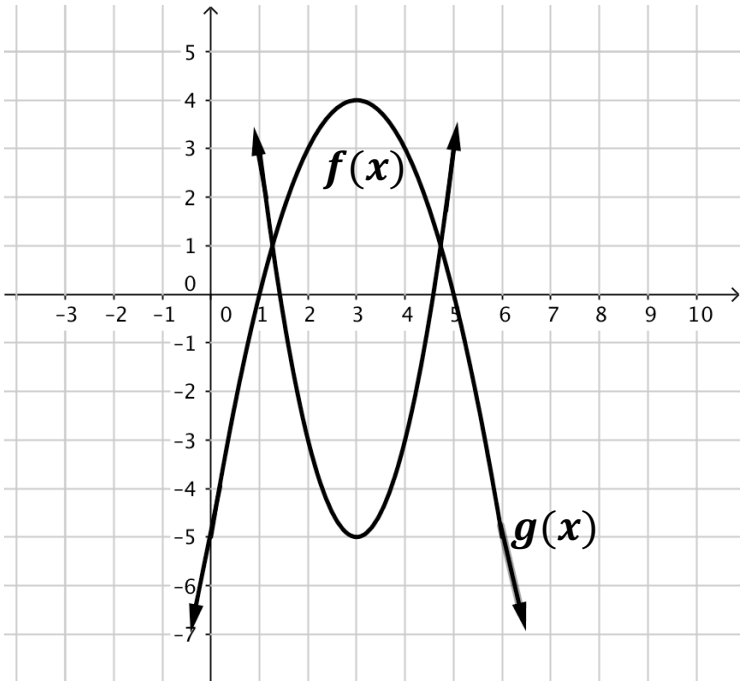
4. The graph of a quadratic function in shown below.



Which statements about this graph are **not** true? Select **all** that apply.

- ☐ The graph has a y-intercept at $(0, 5)$.
- ☐ The graph has a relative maximum point $(-3, 4)$.
- ☐ The graph has an x-intercept at $(1, 0)$.
- ☐ The graph has the y-axis as a line of symmetry.
- ☐ The graph has zeros at $x = -5$ and $x = -1$.
- ☐ The graph represents the function $f(x) = -x^2 - 6x - 5$.

5. Consider functions $f(x)$ and $g(x)$ graphed below.



Which of the following statements are true about $f(x)$ and $g(x)$?

- ☐ The graphs share the same axis of symmetry.
- ☐ The y –intercept for $f(x)$ is greater than the y –intercept for $g(x)$.
- ☐ $f(2) + g(4) = 0$
- ☐ $f(-4) < g(0)$
- ☐ The domain of $f(x)$ has more elements than the domain of $g(x)$.
- ☐ The graphs share the same relative maximum.

Name _____Date_____

Quadratic Functions - Part 2
Nature of the Solutions of Quadratic Functions
Independent Practice

1. Use the discriminant to determine if the following quadratic equations have complex or real solution(s). If an equation has real solution(s), determine the solution(s).

   Part A: $4x^2 - 3x - 10 = 0$

   Part B: $x^2 - 14x + 49 = 0$

   Part C: $g(x) = x^2 - 8x - 20$

   Part D: $h(x) = x^2 - 9x + 36$

   Part E: $3(x + 2)^2 + 26 = 0$

2. Create three quadratic equations that has complex solutions. Justify your answer.

3. Create three quadratic equations that has one real solution.

4. Which of the following quadratic equations have two real solutions? Select all that apply.

- ☐ $9x^2 - 12x + 4 = 0$
- ☐ $-x^2 = 4 - 5x$
- ☐ $2x^2 - 8x = 24$
- ☐ $5x^2 - 10x = 3$
- ☐ $x^2 - 2x = -5$

5. Explain the difference between quadratic equations with one solution, two solutions, and complex solutions.

Name _____ Date_____

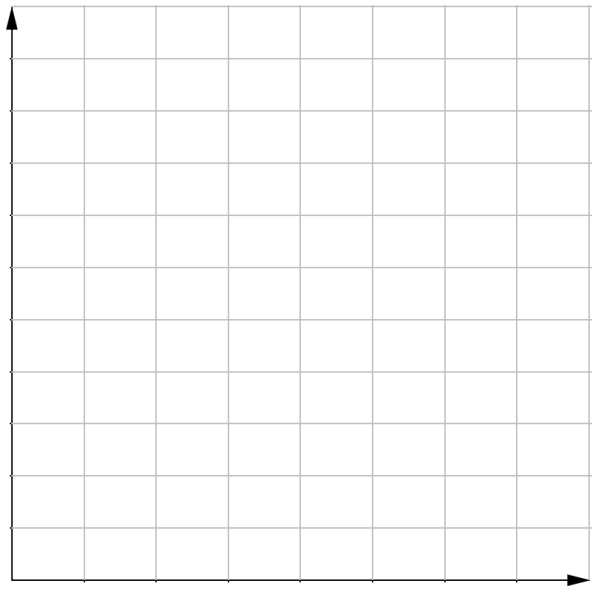
Quadratic Functions - Part 2
Graphing Quadratic Functions Using a Table
Independent Practice

1. A model rocket was launched from a podium 5 meters above ground at a initial velocity of $98\,m/s$. The function that models height (in meters) with respect to time (in seconds) is $h(t) = 5 + 98t - 4.9t^2$.

   Part A: Complete the table below.

Time (seconds)	0	5	10	15	20
Elevation (meters)					

   Part B: Graph function $h(t)$ on the following coordinate grid.



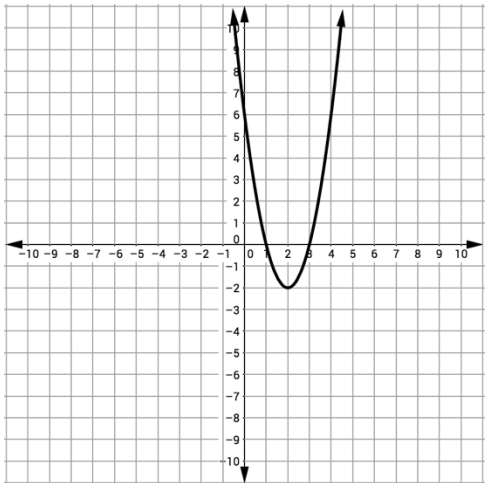
   Part C: Estimate the time when the model rocket lands on the ground. Justify your answer.

2. Consider the following table of values.

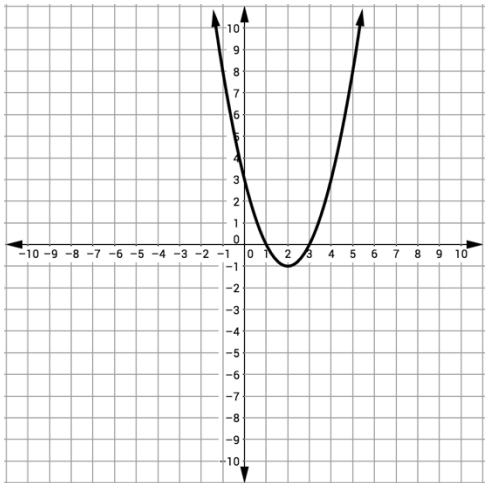
x	-1	0	2	4	5
$f(x)$	8	3	-1	3	8

Which of the following is the graph corresponding to the table of values?

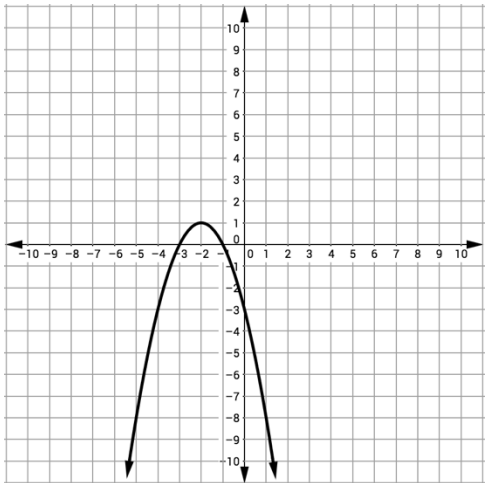
(A)



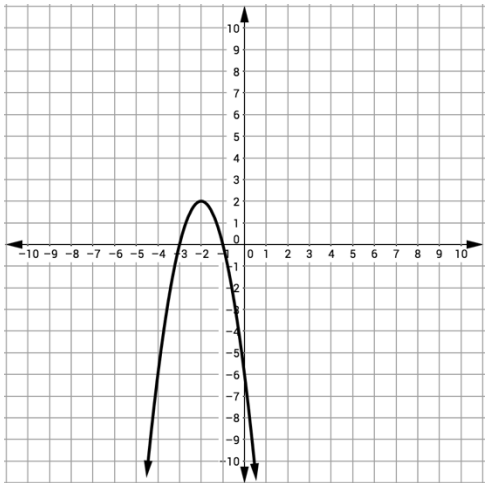
(B)



(C)

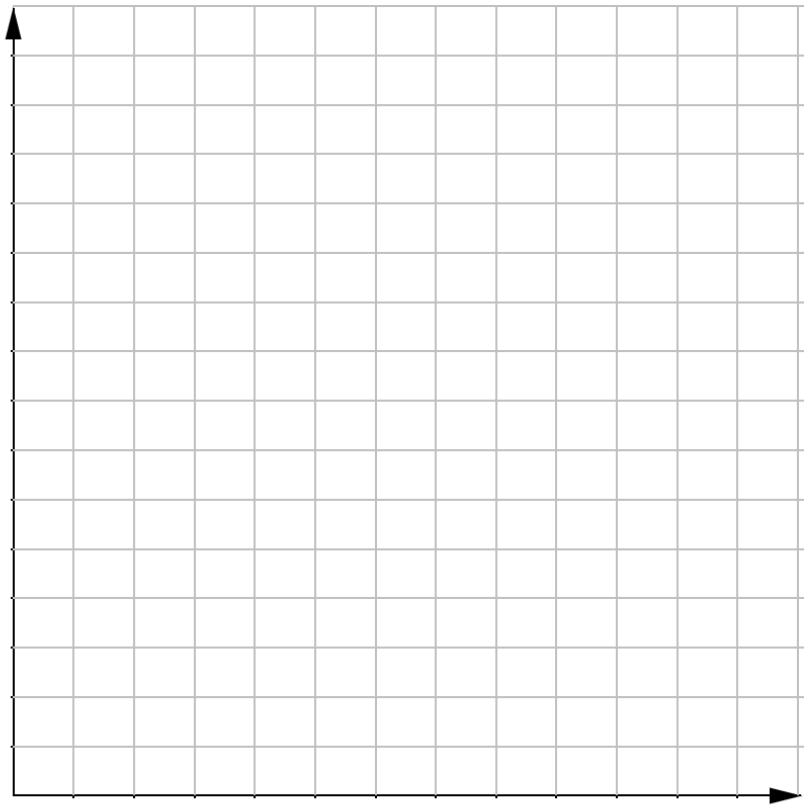


(D)



3. The average rainfall of a certain geographical location is modeled by the table on the right.

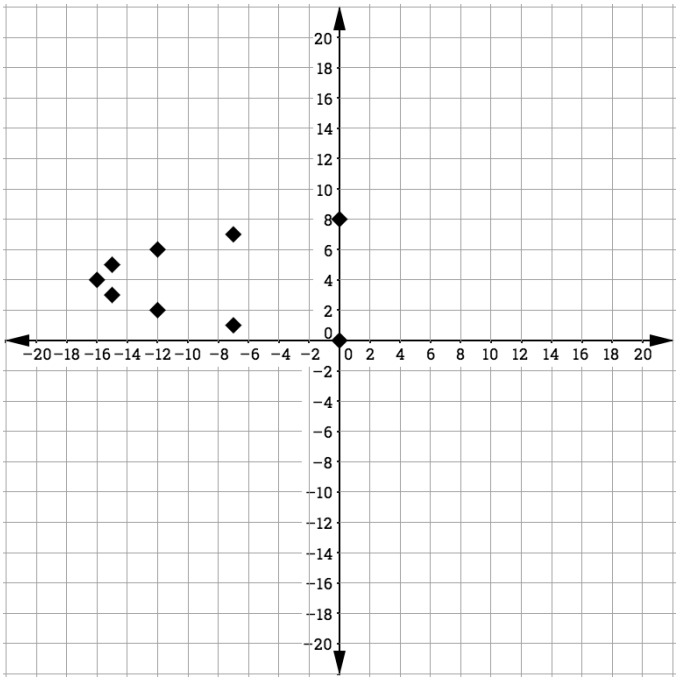
Part A: Plot the data on the graph below if January is equivalent to $x = 0$.



Month	Rainfall (in inches)
Jan	72
Feb	75.7
Mar	78.7
April	81
May	82.6
June	83.6
July	84
Aug	83.6
Sept	82.7
Oct	81
Nov	78.6
Dec	75.7

Part B: What type of geographical location might be represented by this graph?

4. Pierrè was plotting the quadratic function $f(x) = -x^2 + 8x$ for an exit ticket. His work is shown below.



Part A: Complete the table below and graph function on the same coordinate system above.

x	$f(x)$
0	
1	
2	
3	
4	

x	$f(x)$
5	
6	
7	
8	

Part B: His teacher marked it incorrect. Explain why Pierrè's work was counted incorrect.

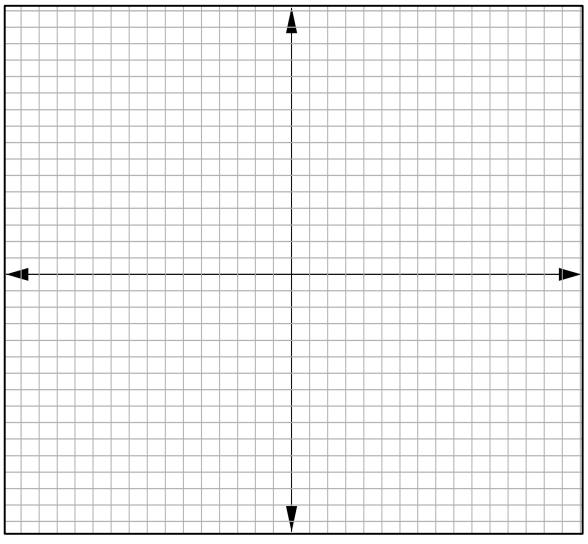
Name _____ Date_____

Quadratic Functions - Part 2
Graphing Quadratic Functions Using the Vertex and Intercepts
Independent Practice

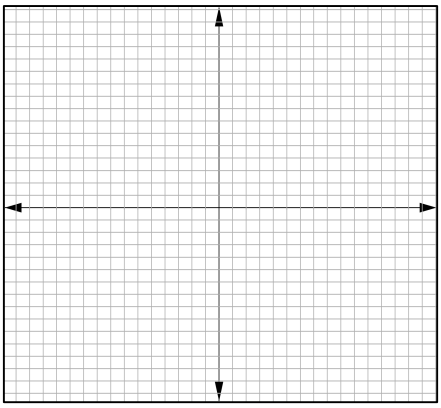
1. Jessica is eating a bag of Sour Skittles. Her friend asks her to share, and Jessica throws over an extra bag. Her friend does not catch the bag, and it hits the ground. The distance from the ground (height) for the bag of candies is modeled by the function $h(t) = -16t^2 + 32t + 4$, where $h(t)$ is the height (distance from the ground in feet) of the candies and t is the number of seconds the candies are in the air. Describe in a paragraph what the graph of this scenario would look like.

2. Graph the following function and identify the key features of the graph.

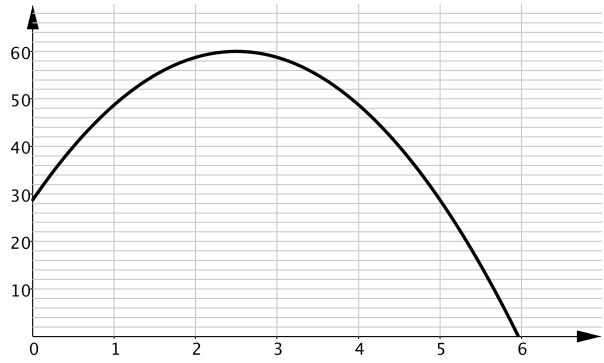
$$g(x) = -2(x - 1)(x + 5)$$



3. Graph the following function, $h(x) = x^2 + 7x + 6$, using the coordinate grid below. Identify the key features of the graph, including the x –intercepts, y –intercept, axis of symmetry, and vertex.

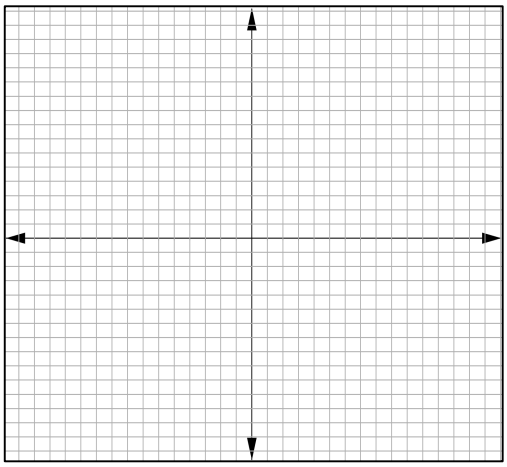


4. Write a short "real world" story about this graph using the key features of a graph of a quadratic equation.



5. In a physics lab, an artifact is dropped from the roof of the school building, 98 feet above the ground. The height h (in feet) of the ball above the ground is given by the function $h(t) = -16t^2 + 98$, where t is the time in seconds.

Part A: Graph the function.



Part B: How far has the artifact fallen from time $t = 0$ to $t = 1$?

Part C: Does the artifact fall the same distance from time $t = 1$ to time $t = 2$ as it does from $t = 0$ to $t = 1$? Explain.

6. *MobiStar* is a mobile services company that sells 800 phones each week when it charges $\$80$ per phone. It sells 40 more phones per week for each $\$2$ decrease in price. The company's revenue is the product of the number of phones sold and the price of each phone. What price should the company charge to maximize its revenue?

   Part A: Let d represent the number of $\$2$ decreases in price. Let r be the company's revenue. Write a quadratic function that reflects the company's revenue.

   Hint: The number of phones sold will be $800 + 40d$ since they sell 40 more phones for every $\$2$ decrease. The price for the phones will be $80 - 2d$ since d is the number of decreases and each decrease is $\$2$.

   Part B: Find the vertex of the quadratic function above. How will finding the vertex help you determine at what price the company should charge to maximize its revenue?

   Part C: Graph this function and show in the graph what price should the company charge.

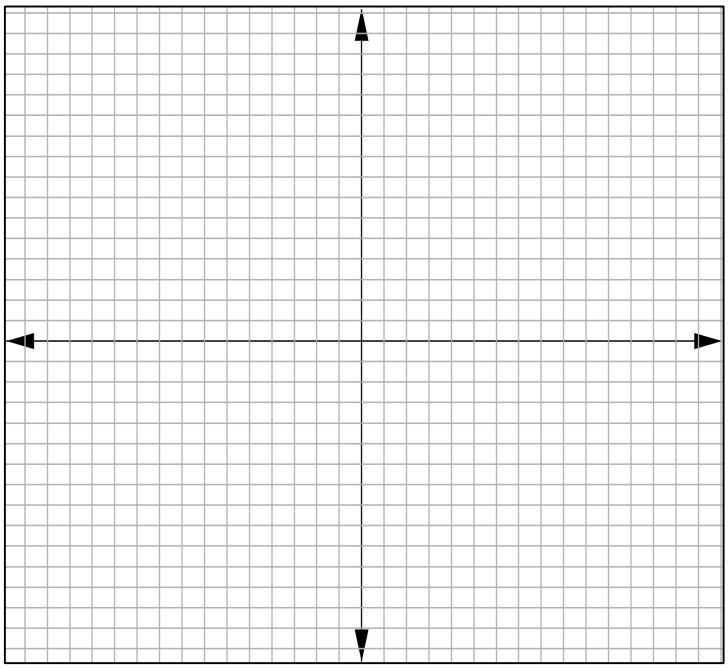
Name _____ Date_____

Quadratic Functions - Part 2
Graphing Quadratic Functions Using Vertex Form - Part 1
Independence Practice

1. Identify the vertex, complete the table and graph $g(x) = (x-4)^2 - 5$.

x	$g(x)$

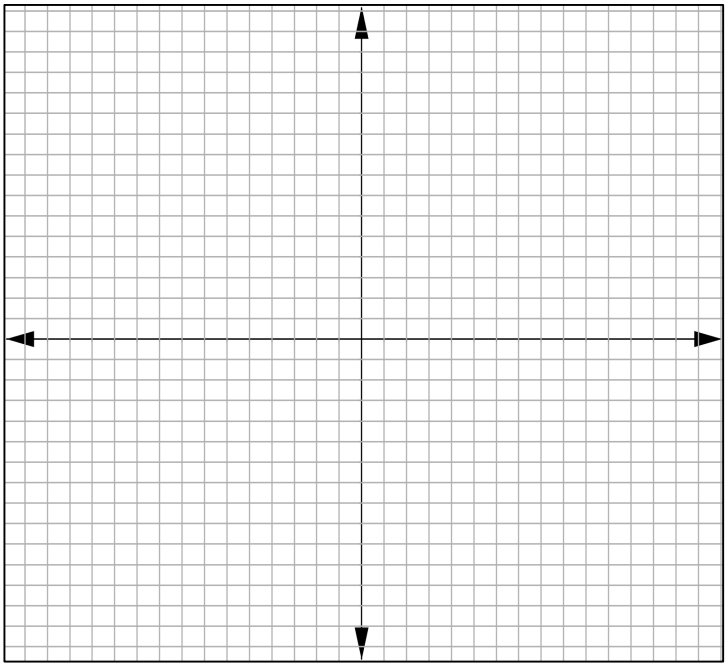
Vertex:



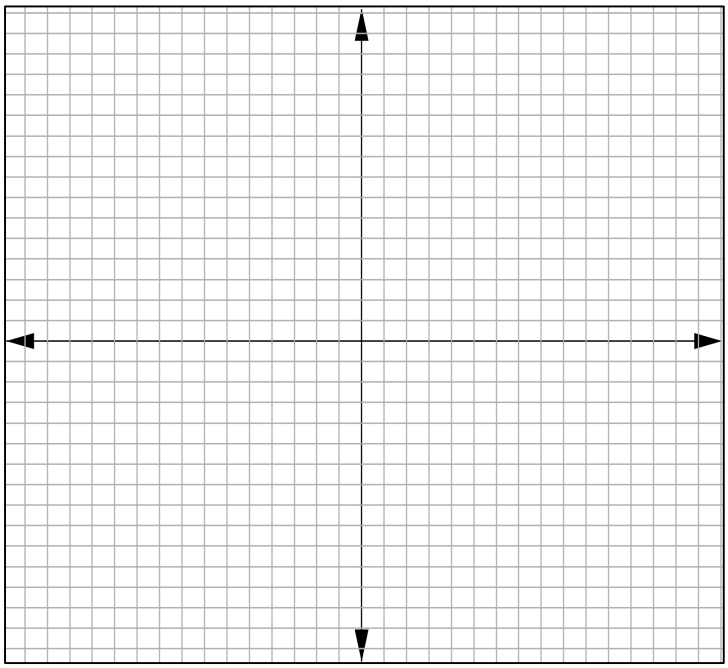
2. Identify the vertex, complete the table and graph $h(x) = (x+1)^2 + 4$.

x	$h(x)$

Vertex:

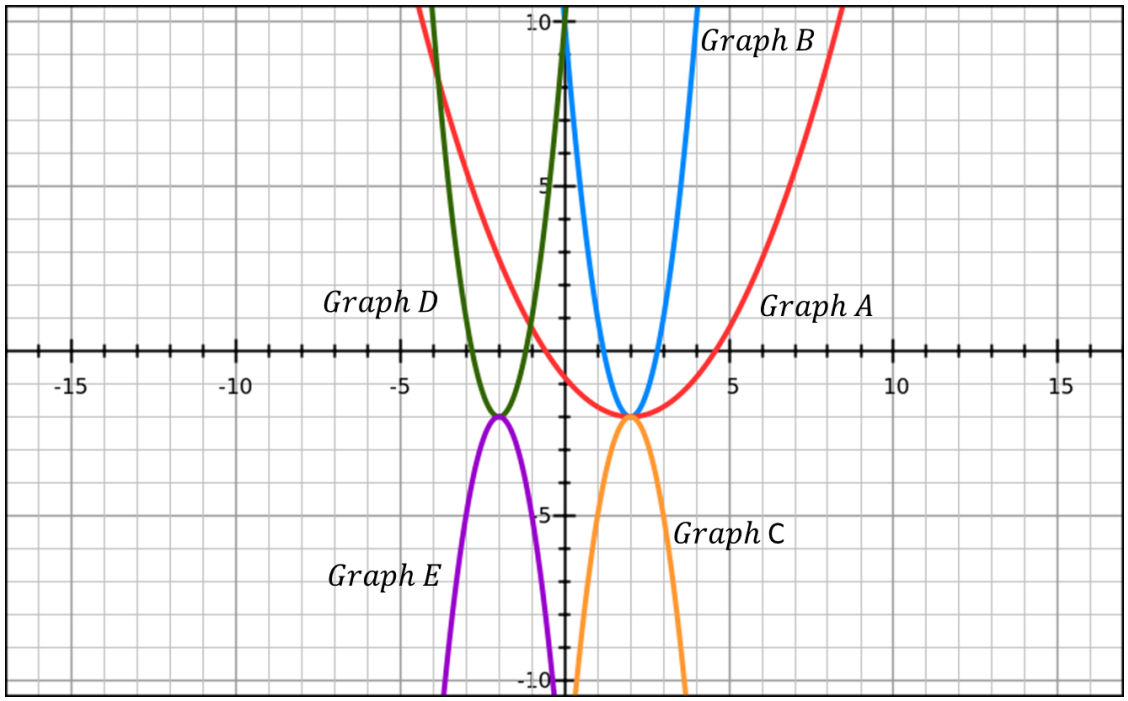


3. Students at Mr. Mackie's art class went outside to draw a rainbow, which follows a parabolic path and has the equation of $y = -0.1(x-1)^2 + 6$, where x and y are measured in centimeters. Graph the function.

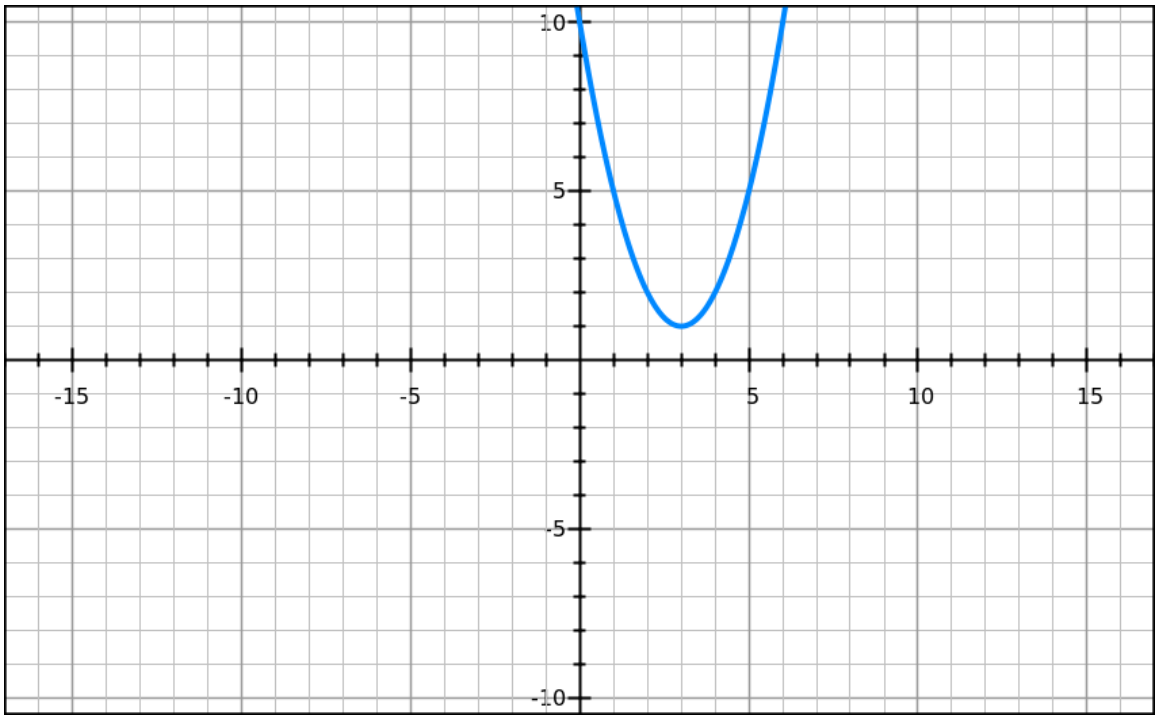


If the height of the rainbow is 6 cm, how far away are the end points of the rainbow from one another?

4. Select and circle the graph that corresponds to this equation $y = 3(x-2)^2 - 2$.



5. Toretto and O'Conner graphed two different quadratic functions in vertex form. Toretto graphed $f(x) = (x + 3)^2 + 1$ and O'Conner graphed $g(x) = -(x - 3)^2 + 1$. Both of them drew the same graph.



Part A: Who drew the correct graph?

A Both of them are correct because the functions are the same.
B Neither of them is correct either because of wrong vertex or wrong direction.
C O'Conner is correct because the vertex is $(3, 1)$.
D Toretto is correct because the graph is positive.

Part B: Justify your answer.

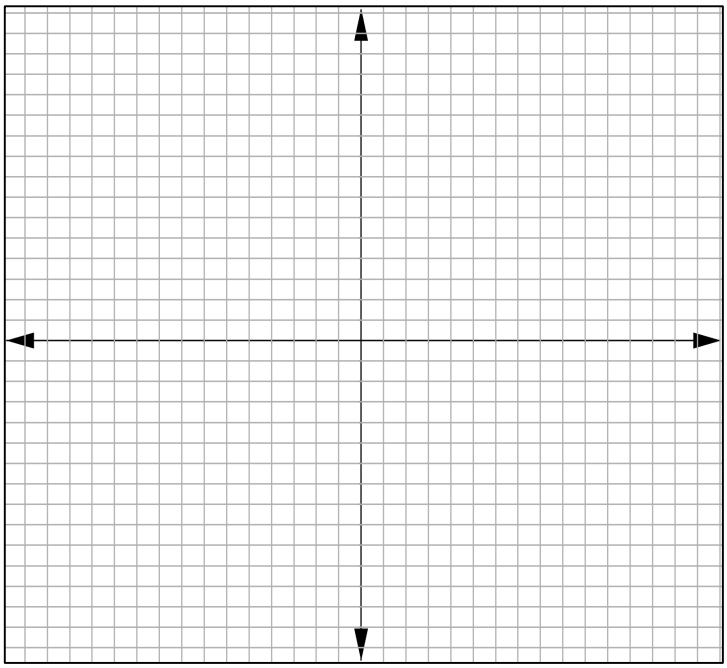
Name _____ Date_____

Quadratic Functions - Part 2
Graphing Quadratic Functions Using Vertex Form - Part 2
Independent Practice

1. Write $f(x) = x^2 - 6x + 8$ in vertex form, using decimals if necessary.

Identify the vertex, fill in the table and graph $f(x)$.

x	$f(x)$



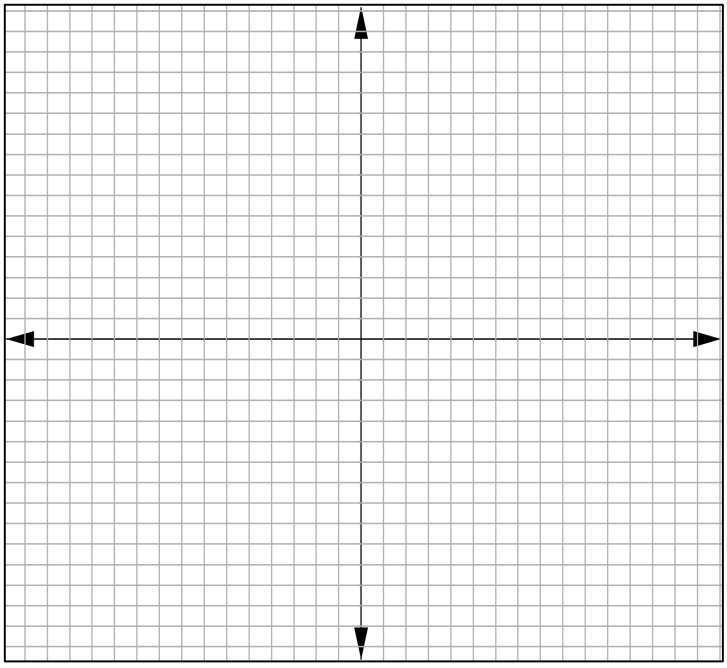
Vertex:

2. For the function $m(x) = 3x^2 + 13x - 30$. Determine the key features.

3. Write $g(x) = 8x^2 - 14x + 3$ in vertex form, using decimals if necessary.

Identify the vertex, fill in the table and graph $g(x)$.

x	$g(x)$



Vertex:

4. April rewrote a quadratic function in vertex form.

$h(x) = 5x^2 - 30x + 30$

Step 1: $h(x) = 5(x^2 - 6x+\quad) + 30$
Step 2: $h(x) = 5(x^2 - 6x + 9) + 30 - 45$
Step 3: $h(x) = 5(x - 3)^2 + 15$

April said that the vertex is $(3, 15)$. Is April correct? If not, identify the step in which April made the mistake and correct her work.

Name _____ Date_____

Quadratic Functions - Part 2
Transformations of the Dependent Variable of Quadratic Functions
Independent Practice

1. Consider the following standard.

> Identify the effect on the graph of replacing $f(x)$ by $f(x)+k$, $kf(x)$, $f(kx)$, and $f(x+k)$ for specific values of k (both positive and negative); find the value of k given the graphs.

Part A: Circle the parts of the standard that indicate a transformation on the dependent variable.

Part B: Describe the transformations.

2. Consider the following functions.

$$f(x) = x^2 + 1$$

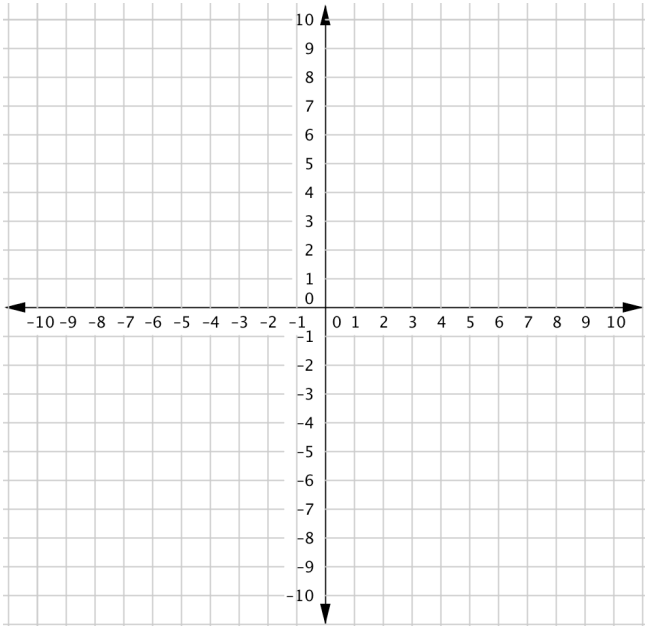
$$g(x) = f(x) + 3$$

$$h(x) = f(x) - 3$$

Part A: Complete the following table for the functions.

x	$f(x)$	$g(x)$	$h(x)$
-2			
-1			
0			
1			
2			

Part B: Graph the functions on the same coordinate plane.



3. Consider the following functions.

$$f(x) = x^2 + 1$$

$$g(x) = -f(x)$$

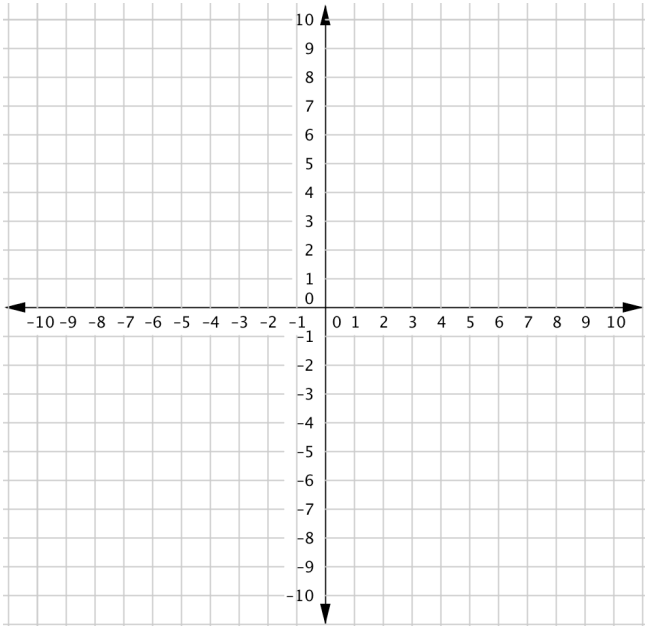
$$h(x) = 2f(x)$$

$$j(x) = \frac{1}{2}f(x)$$

Part A: Complete the following table for the functions.

x	$f(x)$	$g(x)$	$h(x)$	$j(x)$
-2				
-1				
0				
1				
2				

Part B: Graph the functions on the same coordinate plane.



4. Consider the following function. $f(x) = x^2 + 2x + 1$.

Part A: Write a function that shifts $f(x)$ up 5 units.

Part B: Write a function that shifts $f(x)$ down 8 units.

Part C: Write a function that vertically compresses $f(x)$ by $\frac{1}{4}$ units.

Part D: Write a function that vertically stretches $f(x)$ by 6 units.

Part E: Write a function that reflects $f(x)$ about the x –axis.

Name _____ Date_____

Quadratic Functions - Part 2:
Transformations of the Independent Variable of Quadratic Functions
Independent Practice

1. Consider the following standard.

> Identify the effect on the graph of replacing $f(x)$ by $f(x)+k$, $kf(x)$, $f(kx)$, and $f(x+k)$ for specific values of k (both positive and negative); find the value of k given the graphs.

Part A: Circle the parts of the standard that indicate a transformation on the independent variable.

Part B: Describe the transformations.

2. Consider the following functions.

$$f(x) = x^2 + 1$$

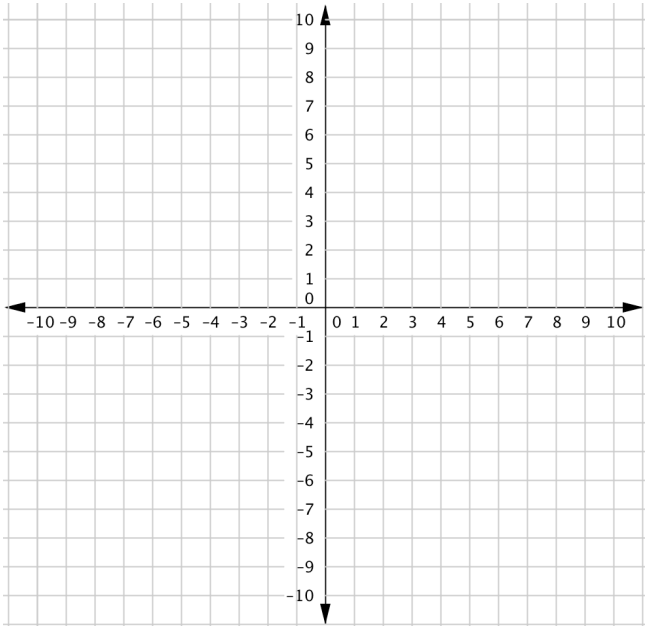
$$g(x) = f(x-5)$$

$$h(x) = f(x+3)$$

Part A: Complete the following table for the functions.

x	$f(x)$	x	$g(x)$	x	$h(x)$
-2					
-1					
0					
1					
2					

Part B: Graph the functions on the same coordinate plane.



3. Consider the following functions.

$$f(x) = x^2 + 1$$

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

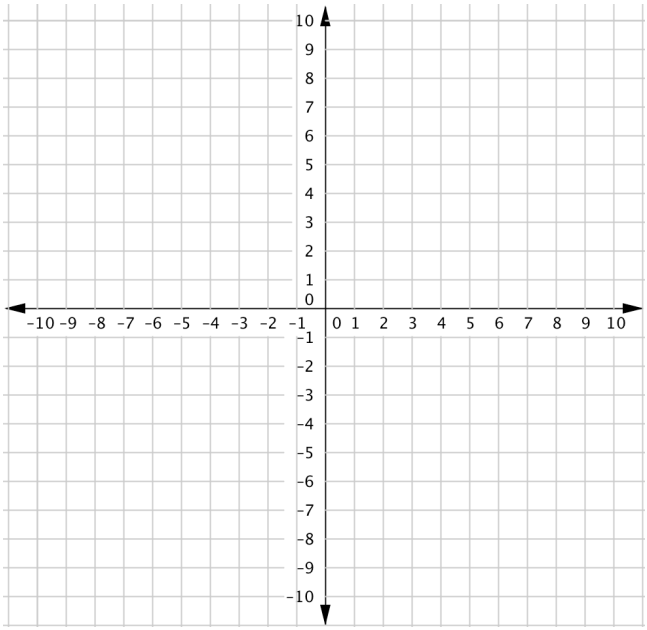
$$h(x) = f(4x)$$

Part A: Complete the following table for the functions.

x	$f(x)$	x	$g(x)$	x	$h(x)$
-2					
-1					
0					

1					
2					

Part B: Graph the functions on the same coordinate plane.



4. Consider the following function. $f(x) = x^2 - 4$.

Part A: Write a function that shifts $f(x)$ left 5 units.

Part B: Write a function that shifts $f(x)$ right 8 units.

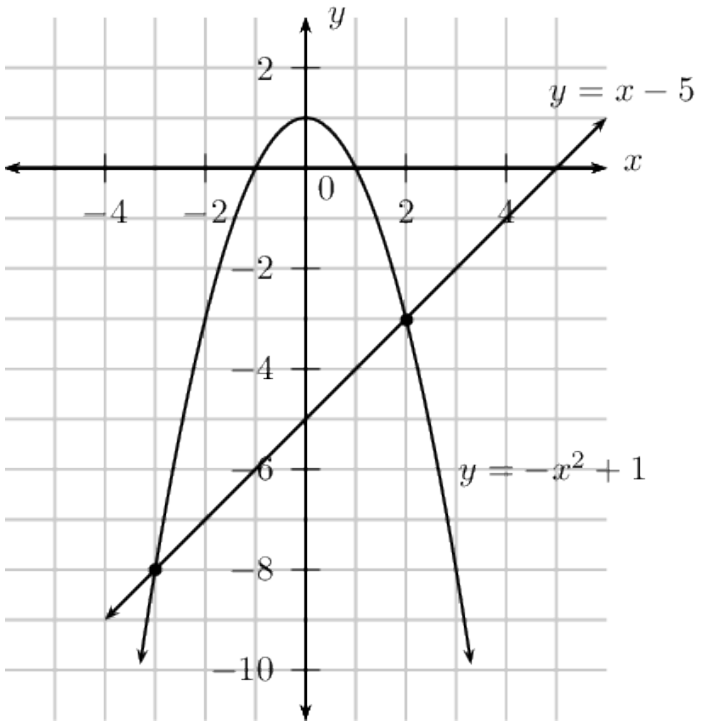
Part C: Write a function that horizontally stretches $f(x)$ by $\frac{1}{4}$ units.

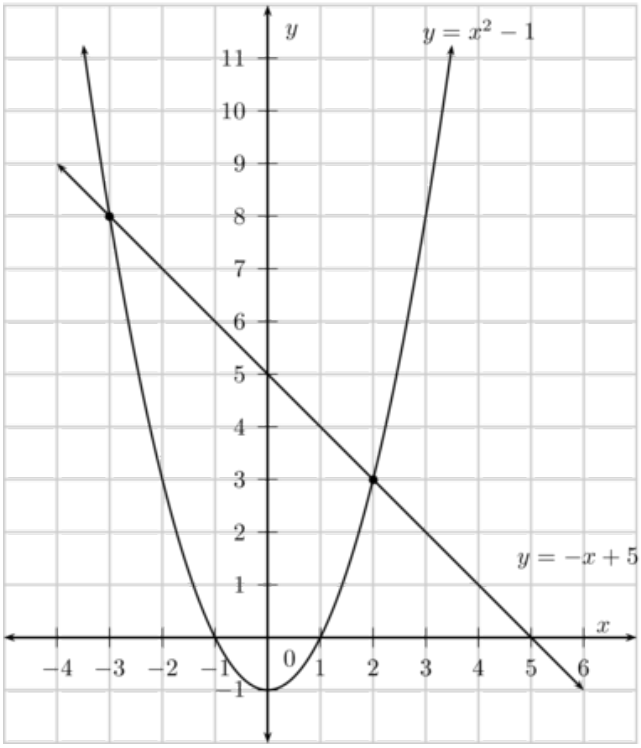
Part D: Write a function that horizontally compresses $f(x)$ by 6 units.

Name _____ Date _____

Quadratic Functions - Part 2
Finding Solution Sets to Systems of Equations Using Tables of Values and Successive Approximations
Independent Practice

1. Use the graphs to verify the solutions of the systems of equations.





2. Consider the following functions.

$$f(x) = x + 3$$
$$g(x) = -3(x - 1)$$

Part A: Complete the table of values for the functions.

x	$f(x)$	$g(x)$
-3		
-2		
-1		
0		
1		
2		
3		

Part B: Use the table to determine the solution(s) to the system of equations.

3. Consider the following functions.

$$f(x) = x^2 + 3$$
$$g(x) = 7x - 7$$

Part A: Complete the table of values for the functions.

x	$f(x)$	$g(x)$
0		
1		
2		
3		
4		
5		
6		
7		

Part B: Use the table to determine the solution(s) to the system of equations.

4. Consider the following functions.

$$f(x) = \sqrt{x+4}$$
$$g(x) = \frac{x-2}{5}$$

Part A: Complete the table of values for the functions.

x	$f(x)$	$g(x)$
-4		
-3		
0		
5		
12		
21		
32		
45		

Part B: Use the table to determine the solution(s) to the system of equations.

5. Use the process of successive approximations to find the positive x solution of the system to the nearest tenth.

$$g(x) = x^2 + 13$$
$$h(x) = 3x + 14$$

x	$g(x)$	$h(x)$
0	13	14
1	14	17
2	17	20
3	22	23
4	29	26

6. Consider the following functions.

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

Part A: Complete the table of values for the functions.

x	$g(x)$	$h(x)$
-2		
-1		
0		
1		
2		
3		
4		

Part B: Use the process of successive approximations to find the positive x solution of the system to the nearest tenth.