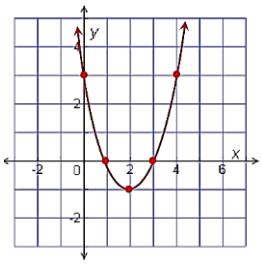
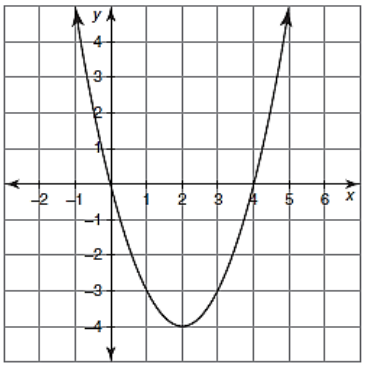
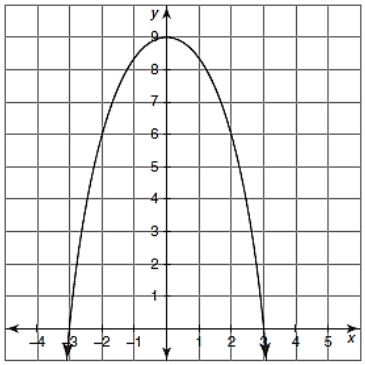
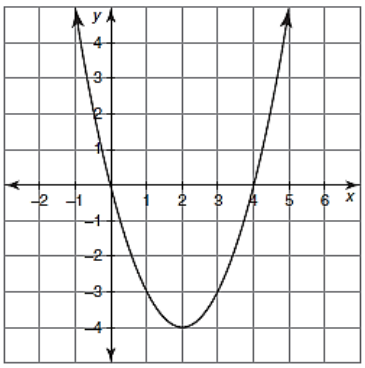
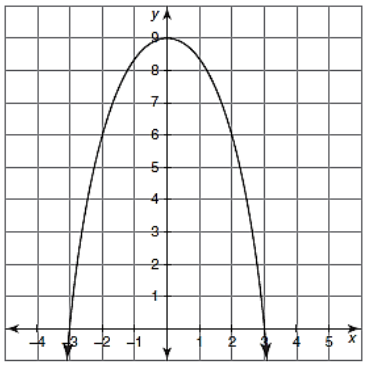
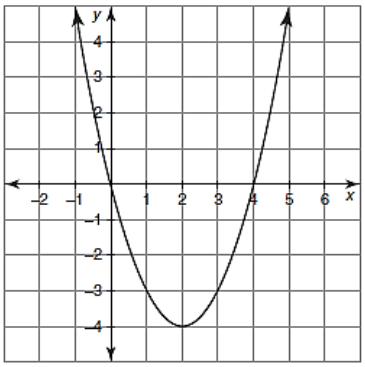
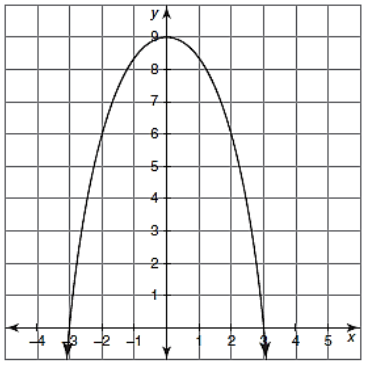
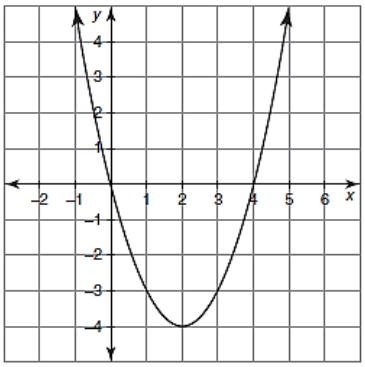
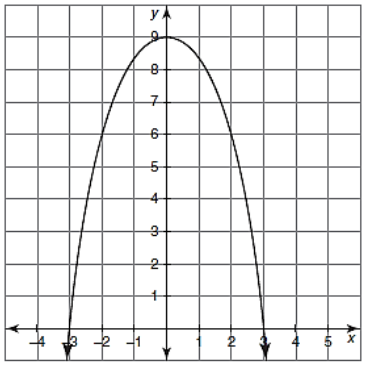
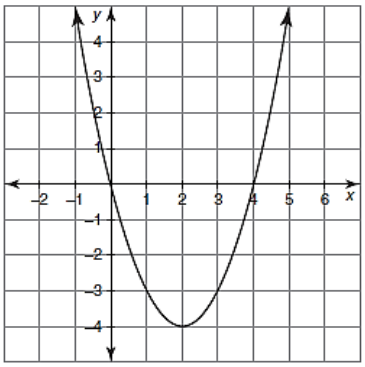
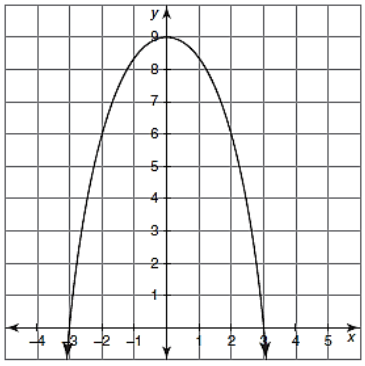
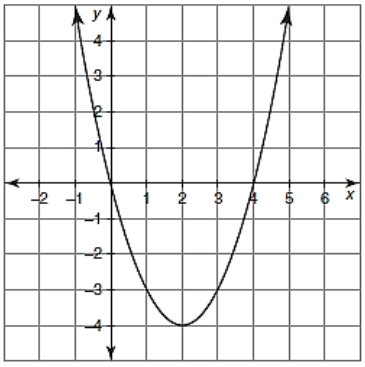
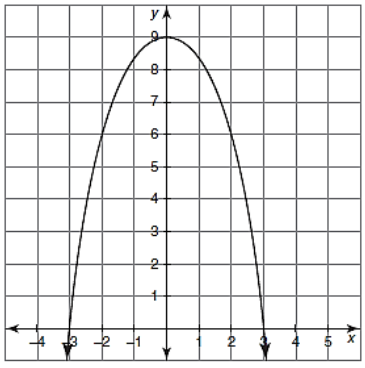
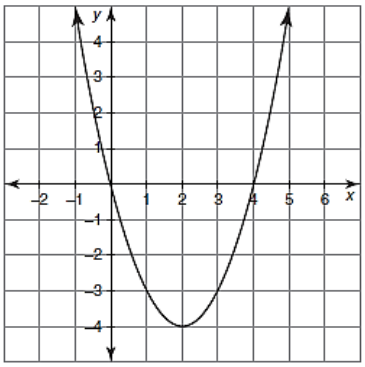
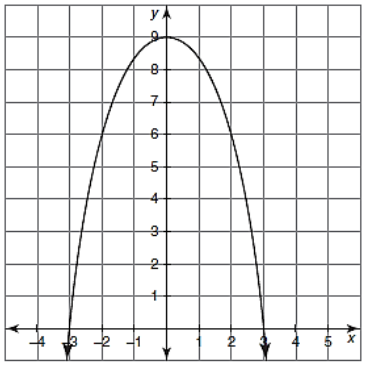
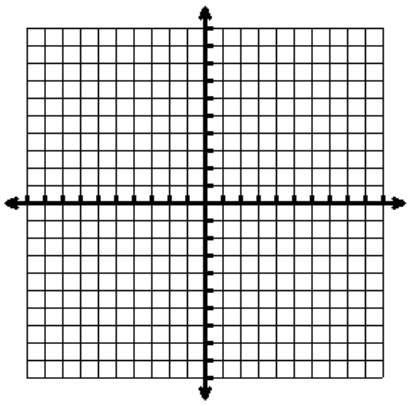
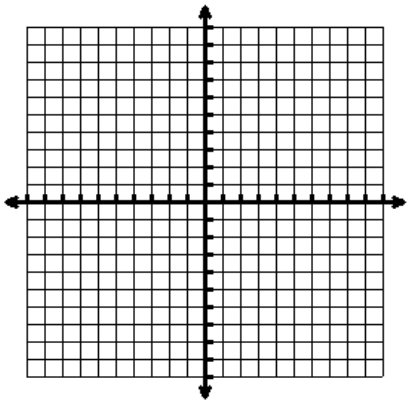
Algebra 1
Unit 3B Study Guide – Quadratic Functions

Name:_____
Date: _____ Period: _____

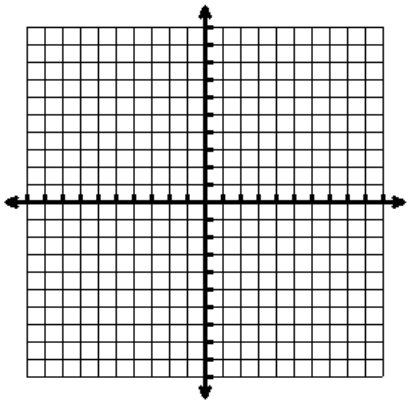
What you need to know & be able to do	Things to remember	Examples	
1. Describe transformations from an equation or graph	$y = a(x - h)^2 + k$ a: stretches/shrinks & reflects h: shifts left & right k: shifts up & down vertex: (h, k)	a. Describe the transformations and name the vertex: $y = -2(x + 3)^2 - 9$	a. Describe the transformations and name the vertex: 
2. Create a function using transformations	Determine your, a, h, and k values	a. Opens down, shifts up 3 units and shrinks by ¼	b. Shifts left 5 and reflects across the x-axis
3. Describe the domain and range.	-Domain: all possible values for x -Range: all possible values for y -"How far up or down does your graph go?" -written as an inequality	a. Domain: Range: 	b. Domain: Range: 
4. Describe the intercepts and zeros.	Zeros and x-intercepts are the same thing. Zeros: x = ___ X-int: (p, 0) (q, 0) Y-int: (0, c)	a. x-intercepts: zeros: y-intercept: 	b. x-intercepts: zeros: y-intercept: 

5. Describe the vertex, axis of symmetry, extrema, and min/max values.	Vertex: highest or lowest point Axis of Symmetry: x value of the vertex; written as x = Extrema: Max or Min? Max/Min Value: What's the lowest or highest your graph goes; written as y =	a. Vertex: Axis of Sym: Extrema: Max/Min Value: 	b. Vertex: Axis of Sym: Extrema: Max/Min Value: 
6. Describe the end behavior.	Which direction are the ends of the graph headed? To positive or negative infinity?	a. As x → -∞, f(x) → _____. As x → ∞, f(x) →_____. 	b. As x → -∞, f(x) → _____. As x → ∞, f(x) →_____. 
7. Describe the intervals of increase or decrease.	Draw your axis of symmetry and create an inequality to represent to the left and right of the axis of symmetry. Then determine which direction the graph is going on the left and then on the right using your inequalities.	a. Interval of Increase: Interval of Decrease: 	b. Interval of Increase: Interval of Decrease: 
8. Describe the positive and negative parts of the graph	Determine which parts of the graph are above or below the x-axis. Use inequalities to describe the different regions using the x-intercepts.	a. Positive: Negative: 	b. Positive: Negative: 

9. Find the average rate of change given a graph	-Determine your two x-values and find their corresponding y-values on the parabola. -Calculate the rate of change (rise over run)	a. On interval from $0 \le x \le 2$: 	b. On interval from $-3 \le x \le 0$: 
10. Find the average rate of change given an equation	Find two points (by substituting x-values into the equation to get your y-values. Then use slope formula	a. Calculate the average rate of change for $y = x^2 + 1$ on the interval $0 \le x \le 2$.	
11. Graph in vertex form	1. Determine your vertex. 2. Create a table with 2 values to the left and right of the vertex. 3. Graph.	a. Graph the following equation: $y = -3(x-2)^2 + 5$ 	
12. Graph in standard form	1. Determine your vertex $\left(x = \frac{-b}{2a}\right)$. 2. Create a table with 2 values to the left and right of the vertex. 3. Graph.	a. Graph the following equation: $y = x^2 + 4x + 7$ 	

<table>
<tr><td>13. Graph in factored form</td><td>1. Determine your x-intercepts and plot them.

2. Determine you vertex (find the middle of the two x-intercepts or use $x = \frac{p+q}{2}$).

3. Plot vertex and graph.</td><td colspan="2">a. Graph the following equation: $y = -(x+1)(x-5)$
  </td></tr>
<tr><td rowspan="2">14. Different Forms of Quadratics</td><td rowspan="2">Vertex Form:
$y = a(x - h)^2 + k$
(h, k) is vertex

Standard Form:
$y = ax^2 + bx + c$
(0, c) is y-intercept

Factored Form:
$y = a(x - p)(x - q)$
(p, 0) & (q, 0) are x-intercepts

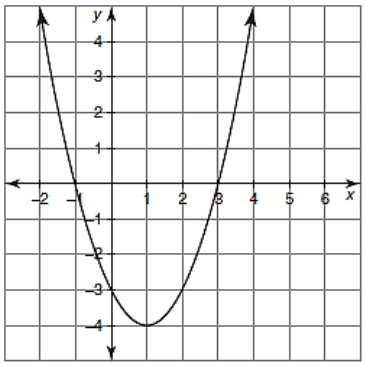
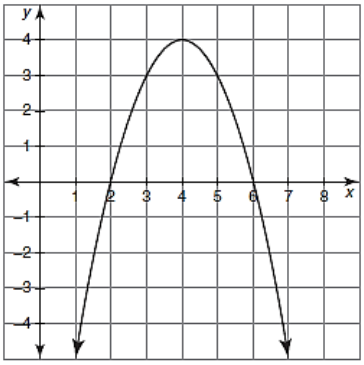
A determines if graph opens up or down</td><td>a. Determine the form and associated characteristics: $y = 2(x + 4)(x - 3)$</td><td>b. Determine the form and associated characteristics: $y = (x - 5)^2 + 9$</td></tr>
<tr><td>c. Determine the form and associated characteristics: $y = -x^2 + 6x - 1$</td><td>d. Determine the form and associated characteristics: $y = -(x + 2)^2$</td></tr>
<tr><td rowspan="2">15. Converting between forms</td><td rowspan="2">Use your Converting Between Forms graphic organizer.</td><td>a. What characteristics can you describe in $y = (x + 4)(x - 7)$?

Convert to standard form. What new characteristic can you give?</td><td>b. What characteristics can you describe in $y = (x + 3)^2 - 5$

Convert to standard form. What new characteristic can you give?</td></tr>
<tr><td>c. What characteristics can you describe in $y = x^2 + 6x + 4$

Convert to vertex form. What new characteristic can you give?</td><td>d. What characteristics can you describe in $y = x^2 - 5x - 24$

Convert to factored form. What new characteristic can you give?</td></tr>
</table>

16. Create equations given characteristics	Determine the best form to represent the given characteristics	a. Given: X-intercepts of (7, 0) and (-8, 0) and graph opens up	b. Given: Vertex of (-3, -6) and graph has a maximum
17. Create equations given graphs		a.  Vertex Form: Intercept Form: Standard Form:	b.  Vertex Form: Intercept Form: Standard Form:
18. Applications of the Vertex	Maximum/Minimum indicate finding the vertex. Describe what you know about your equation before completing any solving. Interpret the vertex in terms of what x and y represent.	a. The height in feet of a rocket after x second is given by $y = -16x^2 + 128x$. What is the maximum height reached by the rocket and how long does it take to reach that height?	b. The arch of bridge is modeled by the equation $y = -\frac{1}{4}(x - 50)^2 + 95$, where x represent the horizontal distance (in feet) and y represents the vertical distance (in feet). What is the maximum height of the arch?

c.

You run a canoe rental business on a small river in Georgia. You currently charge $12 per hour canoe and average 36 rentals a day. An industry journal says that for every fifty cent increase in rental price, the average business can expect to lose two rentals a day.

a. Use this information to attempt to maximize your income. What should you charge?

Price	Number of Rentals	Revenue
$12	36	

19. Comparing Quadratic Functions

a. Which representation has the greater y-intercept:

A. $y = x^2 + 6x - 2$

B.

X	-3	-2	-1	0	1
Y	-2	-5	-6	-5	-2

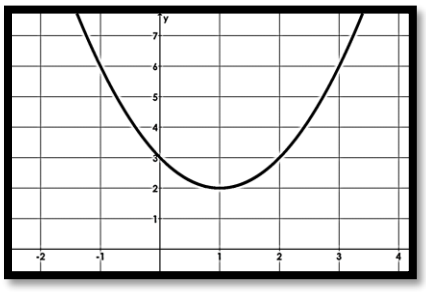
C. $y = (x + 3)(x - 1)$

b. What representation has the smallest minimum value?

A.

X	-1	0	1	2
y	1	-2	-3	-2

B.



C. $y = x^2 - 2x + 6$