Algebra 2 Name:_____

Unit 5 – Day 1 – Graphing Parabolas in Standard Form Period:_____Date:_____

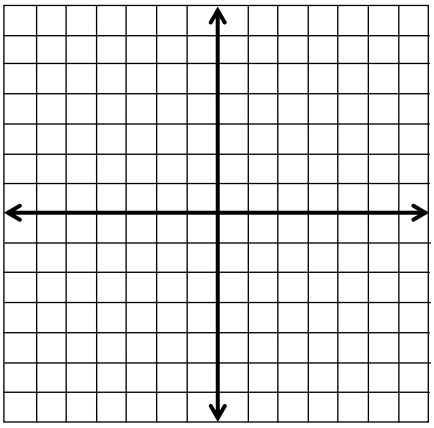
<u>Graph a function in the form of y = ax^2 + bx + c.</u>

1. $y = x^2 + 4x - 1$

A.S._____

Vertex:_____(Min/Max)

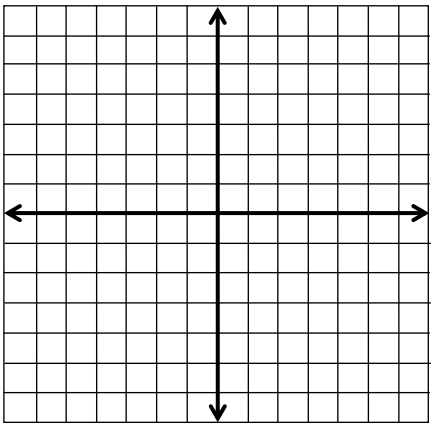
x	y



2. $y = -x^2 - 1$

A.S._____

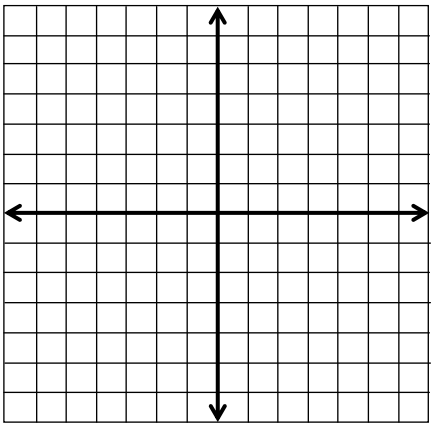
Vertex:_____(Min/Max)



3. $g(x) = -2x^2 + 4x + 3$

A.S._____

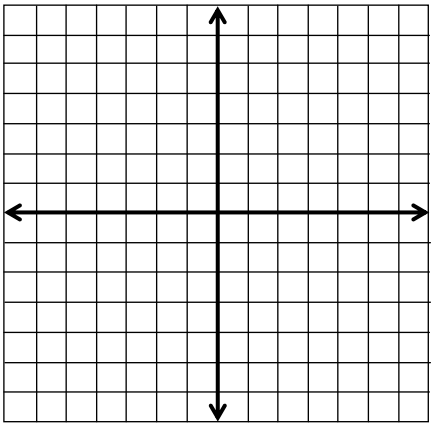
Vertex:_____(Min/Max)



4. $y = \frac{1}{4}x^2 + 2x$

A.S._____

Vertex:_____(Min/Max)

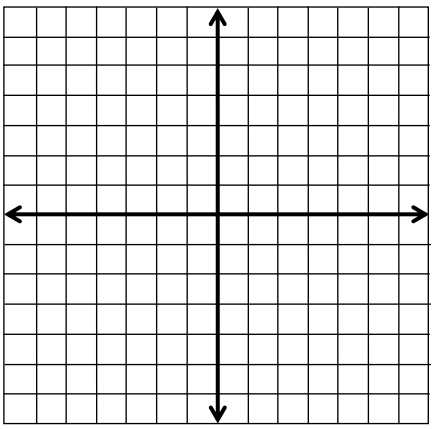


5. $f(x) = -x^2 - 2x - 4$

A.S._____

Vertex:_____(Min/Max)

x	$f(x)$

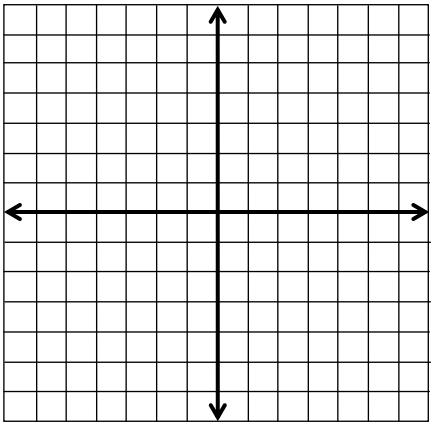


6. $y = 4x^2 - 8x + 4$

A.S._____

Vertex:_____(Min/Max)

x	y



<u>Find the minimum or maximum value.</u>

7. $y = 3x^2 - 12x + 16$

8. $f(x) = \frac{1}{2}x^2 - 6x + 19$

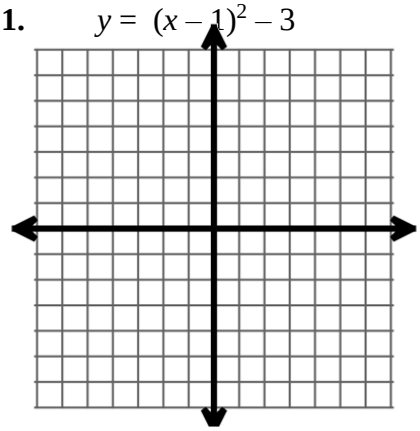
<u>Review: Factor the following:</u>

9. $y = 4x^2 - 12x + 9$

Algebra 2
Unit 5 – Day 2 – Graphing Parabolas in Vertex Form

Name:_____
Period:_____Date:_____

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

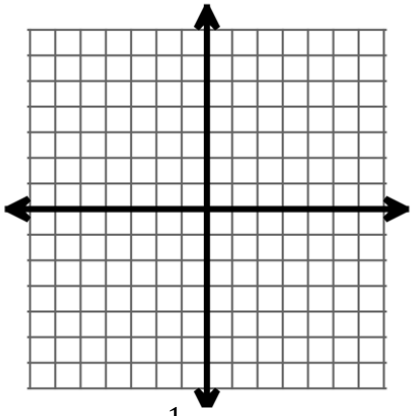


Vertex:_____

Min/Max:_____

Axis of Sym:_____

2. $y = (x + 2)^2 - 1$

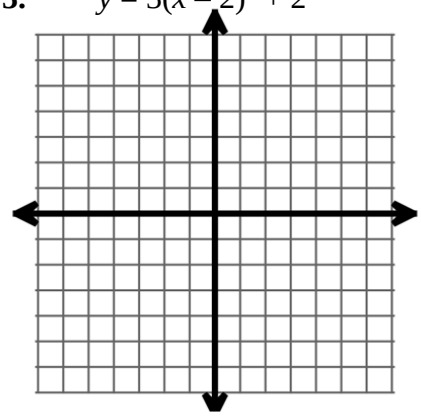


Vertex:_____

Min/Max:_____

Axis of Sym:_____

3. $y = 3(x - 2)^2 + 2$

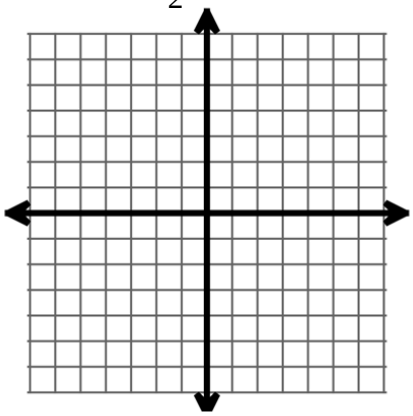


Vertex:_____

Min/Max:_____

Axis of Sym:_____

4. $y = -\frac{1}{2}(x + 1)^2 + 1$

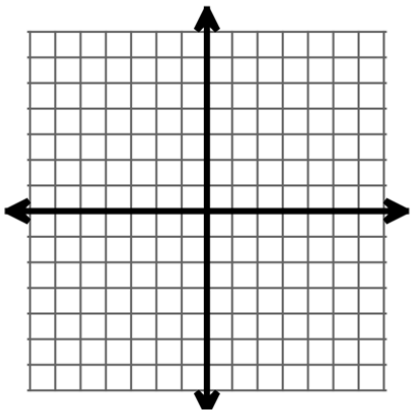


Vertex:_____

Min/Max:_____

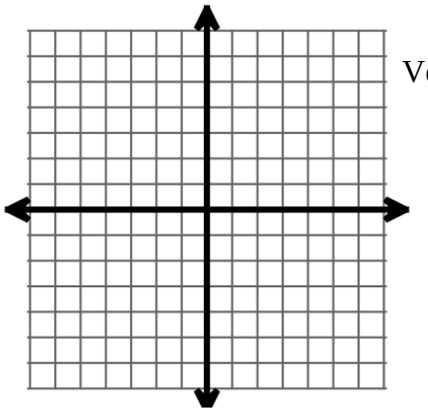
Axis of Sym:_____

5. $y = (x - 3)^2$



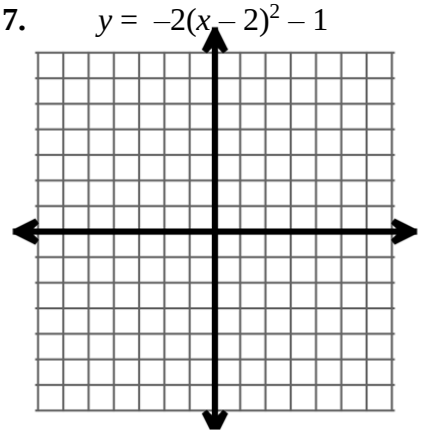
Vertex:_____

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



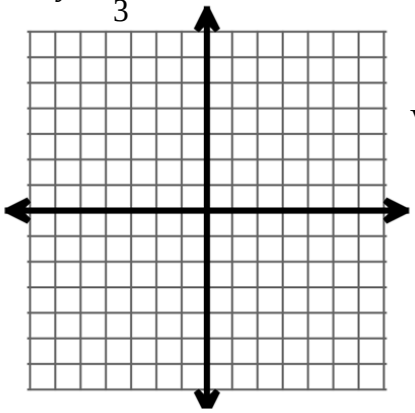
Vertex:_____

7. $y = -2(x - 2)^2 - 1$



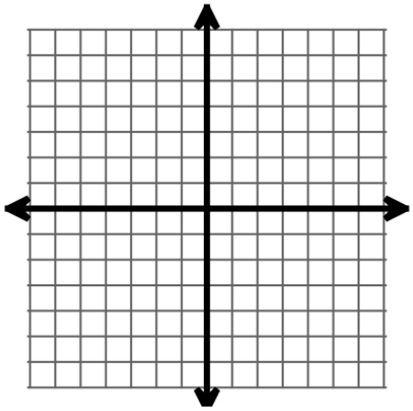
Vertex:_____

8. $y = \frac{1}{3}x^2 - 3$



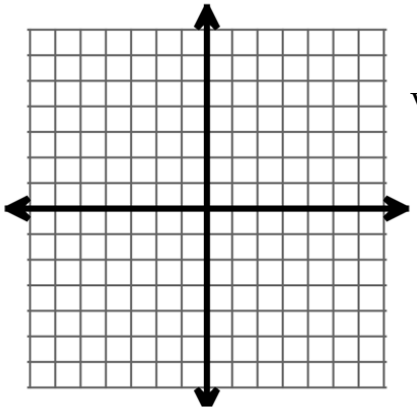
Vertex:_____

9. $y = 3x^2$



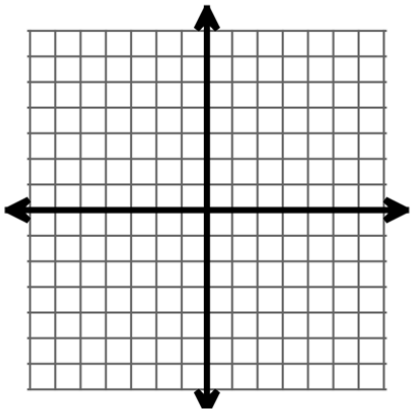
Vertex:_____

10. $y = (x + 2)^2 + 2$



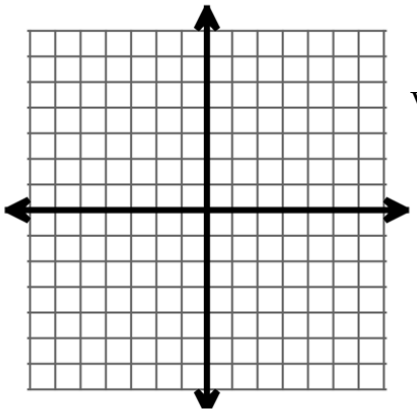
Vertex:_____

11. $y = 2x - 3$



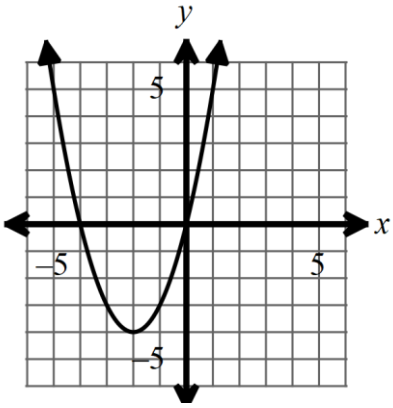
Vertex:_____

12. $y = -(x - 2)^2 + 4$



Vertex:_____

13. Does the graph to the right have the same vertex as $(x) = (x - 2)^2 - 4$?



14. The graph of $f(x) = x^2$ is vertically compressed by a factor of $\frac{1}{2}$ and translated to the right three units and down one unit to produce the function $g(x)$. Which of the following equations represents $g(x)$?

A) $g(x) = \frac{1}{2}(x + 3)^2 + 1$ **B)** $g(x) = \frac{1}{2}(x + 1)^2 + 3$ **C)** $g(x) = \frac{1}{2}(x - 3)^2 - 1$

<u>Review: Factor the following</u>

15. $3x^2 - 6x + 1$

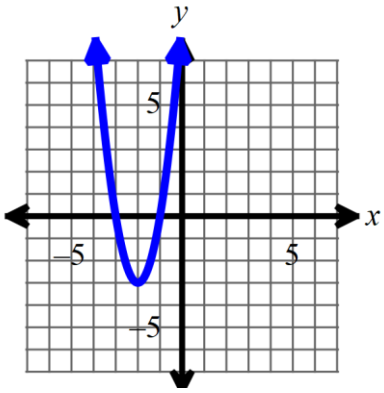
16. $5x^2 - 125$

Algebra 2 Name:_____

Unit 5 – Day 3 – Domain/Range/End Behavior Period:_____Date:_____

Given the following graphs, find their end behavior.

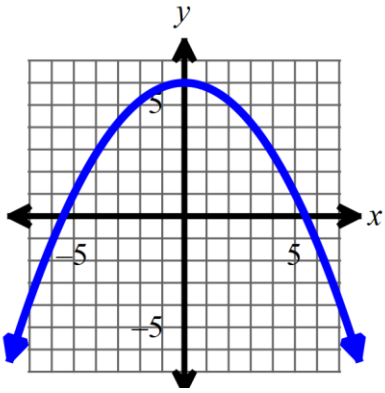
1.



$f(x) \to$ _____ $as\ x \to -\infty\ and$

$f(x) \to$ _____ $as\ x \to +\infty$

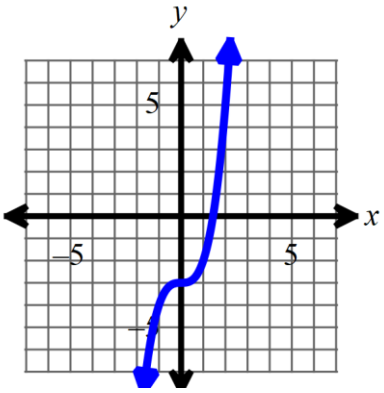
2.



$f(x) \to$ _____ $as\ x \to -\infty\ and$

$f(x) \to$ _____ $as\ x \to +\infty$

3.



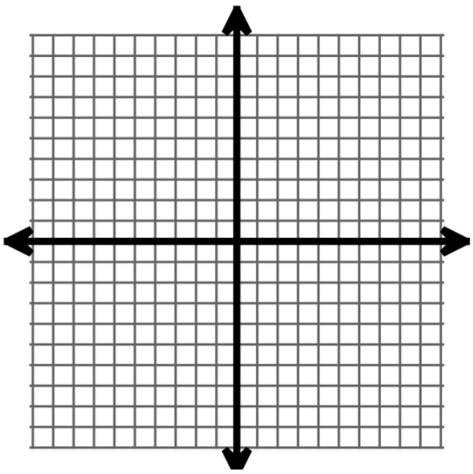
$f(x) \to$ _____ $as\ x \to -\infty\ and$

$f(x) \to$ _____ $as\ x \to +\infty$

For each of the given functions, sketch the graph of the relation, creating a table of values if necessary. Use the graph and the equation to fill in the table relating to each graph.

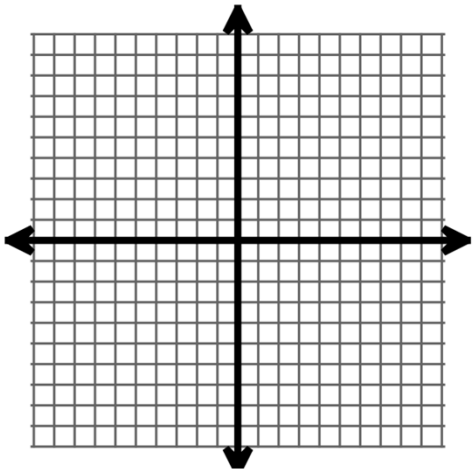
4. $y = x^2 + 2x - 8$

Domain	
Range	
Min/Max Value	
Vertex	
Sign of Leading Coefficient	
End Behaviour	



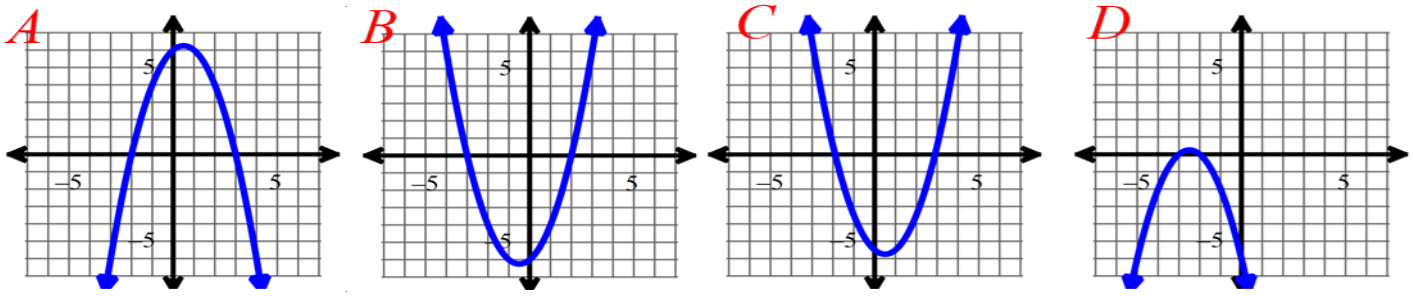
5. $y = 2(x-4)^2 - 5$

Domain	
Range	
Min/Max Value	
Vertex	
Sign of Leading Coefficient	
End Behaviour	



6. Match each given function with the graphs below.

$y=-\left(x+\frac{5}{2}\right)^2+\frac{1}{4}$ $\quad$ $y=\left(x-\frac{1}{2}\right)^2-\frac{23}{4}$ $\quad$ $y=x^2+x-6$ $\quad$ $y=-x^2+x+6$



Algebra 2 Name:_____

Unit 5 – Day 5 – Completing the Square Period:_____Date:_____

Find the number which would create a perfect square trinomial, then write your answer in factored form.

1. $x^2 + 6x +$ _____

2. $y^2 + 10y +$ _____

3. $x^2 - 5x +$ _____

Complete the square in order to write the equation in vertex form. Then state the vertex.

4. $y = x^2 + 6x +$ ___ – ____

Vertex: _____

5. $y = -x^2 - 10x +$ ___ – ____

Vertex: _____

6. $f(x) = -x^2 + 2x$

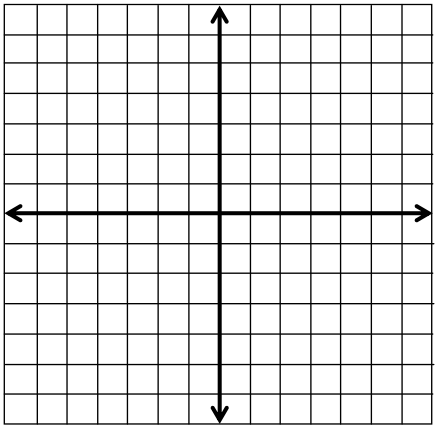
Vertex: _____

7. $f(x) = x^2 - 24$

Vertex: _____

Complete the square in order to write the equation in vertex form. Then state the vertex. Then graph.

8. $f(x) = x^2 + 3x$

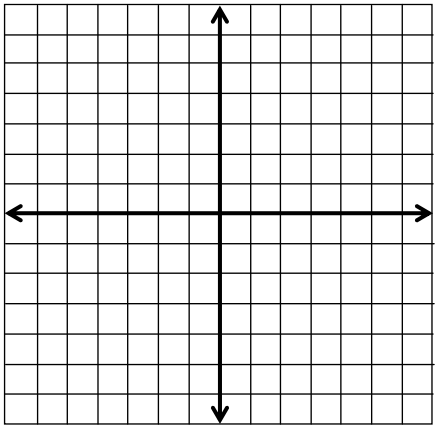


Vertex:_____

Domain:_____ Range: _____

End Behavior: $f(x) \to$ _____ $as\ x \to -\infty\ and$
$f(x) \to$ _____ $as\ x \to +\infty$

9. $y = x^2 - 6x$



Vertex:_____

Domain:_____ Range: _____

End Behavior: $f(x) \to$ _____ $as\ x \to -\infty\ and$
$f(x) \to$ _____ $as\ x \to +\infty$

Algebra 2 Name:_____

Unit 5 – Day 6 – Graphing Parabolas in Vertex Form Period:_____Date:_____

<u>Write in vertex form and then state the vertex</u>

1) $y = x^2 - 10x + 36$

Vertex:_____

2) $f(x) = -x^2 + 8x + 17$

Vertex:_____

3) $y = x^2 + 6x + 13$

Vertex:_____

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

Vertex:_____

5) $f(x) = x^2 + 3x$

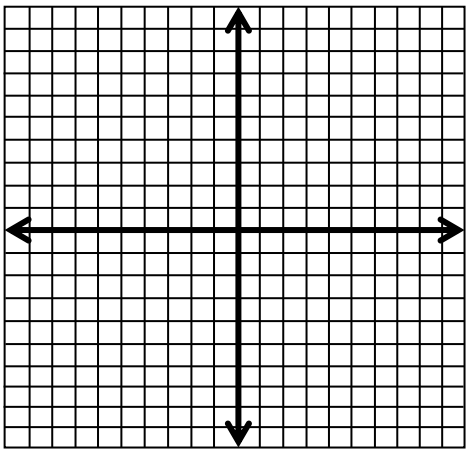
Vertex:_____

6) $y = x^2 + 5x + 8$

Vertex:_____

<u>Write in vertex form, **graph**, and state the domain & range</u>

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



Vertex:_____ Axis of Sym:_____

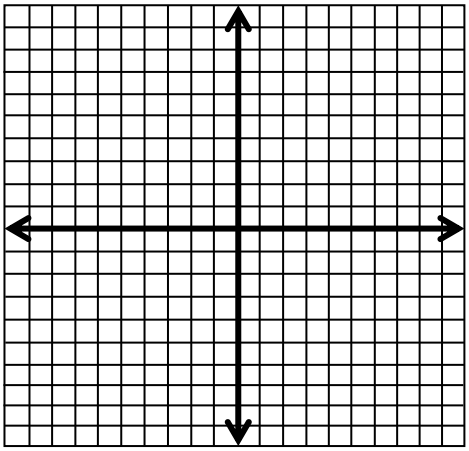
Domain:_____ Range:_____

End Behavior:

$f(x) \to$ _____ $as\ x \to -\infty\ and$

$f(x) \to$ _____ $as\ x \to +\infty$

8) $f(x) = -x^2 + 8x - 14$



Vertex:_____ Axis of Sym:_____

Domain:_____ Range: _____

End Behavior:

$f(x) \to$ _____ $as\ x \to -\infty\ and$

$f(x) \to$ _____ $as\ x \to +\infty$

Algebra 2 Name:_____

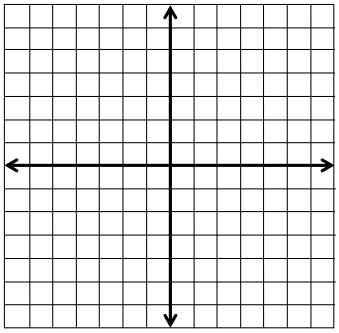
Unit 5 – Day 7 – Graph in Intercept Form Period:_____Date:_____

Write the following functions in intercept form.

1. $y = -x^2 - 6x - 9$ **2.** $f(x) = 2x^2 + 9x + 4$ **3.** $g(x) = x^2 + x - 20$ **4.** $h(x) = -9x^2 + 49$

Graph the following quadratic functions. Label the vertex, the axis of symmetry, and state the domain and range.

5. $f(x) = (x-3)(x+1)$



Vertex:

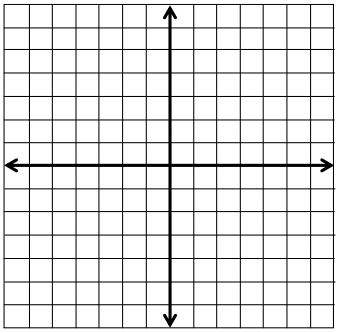
Axis of Sym:

Domain:

Range:

Zeros:

6. $y = .25(x+4)(x-2)$



Vertex:

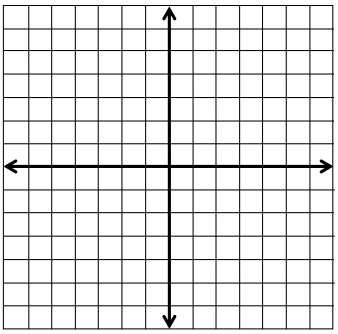
Axis of Sym:

Domain:

Range:

Zeros:

7. $y = x^2 + 6x + 5$



Vertex:

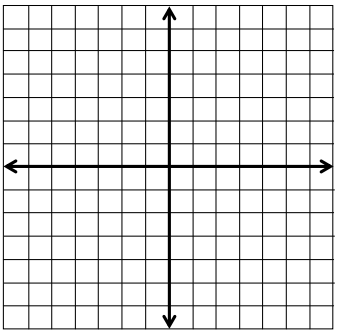
Axis of Sym:

Domain:

Range:

Zeros:

8. $f(x) = x^2 - 4x + 4$



Vertex:

Axis of Sym:

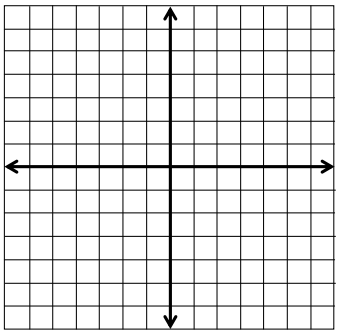
Domain:

Range:

Zeros:

Graph the following quadratic functions. Label the vertex, the axis of symmetry, state the domain and range, and identify the end behavior of the graphs.

9. $f(x) = -\frac{1}{2}(x-1)(x+3)$



Vertex:

Axis of Sym:

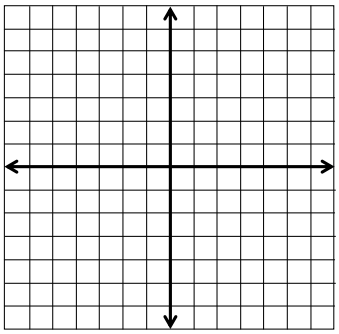
Domain:

Range:

Zeros:

$f(x) \to$ ___ as $x \to -\infty$ and $f(x) \to$ ___ as $x \to \infty$

10. $g(x) = -2(x-2)(x+1)$



Vertex:

Axis of Sym:

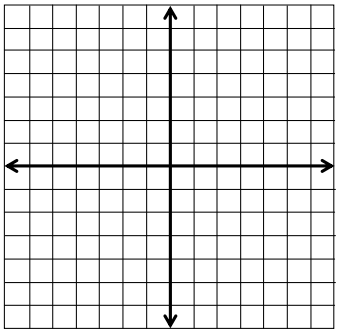
Domain:

Range:

Zeros:

$g(x) \to$ ___ as $x \to -\infty$ and $g(x) \to$ ___ as $x \to \infty$

11. $f(x) = 2x^2 - 6x$



Vertex:

Axis of Sym:

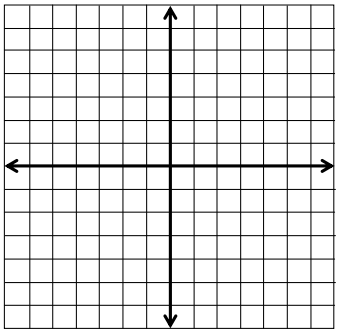
Domain:

Range:

Zeros:

$f(x) \to$ ___ as $x \to -\infty$ and $f(x) \to$ ___ as $x \to \infty$

12. $y = -2x^2 + 2$



Vertex:

Axis of Sym:

Domain:

Range:

Zeros:

$y \to$ ___ as $x \to -\infty$ and $y \to$ ___ as $x \to \infty$

13. Which quadratic function, when graphed, has x-intercepts of -10 and 6?

A. $y = (1 - 10x)(6x + 1)$

B. $y = (x + 10)(2x - 12)$

C. $y = (x - 10)(x + 6)$

D. $y = (10 - 6x)(6x + 10)$

Algebra 2
Unit 5 – Day 8 – Changing Quadratic Forms

Name:_____
Period:_____Date:_____

Write the following functions in standard form.

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

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

Convert the following to Vertex Form.

3) $y = x^2 + 2x - 8$

4) $f(x) = x^2 - 9$

Convert the following to Intercept Form.

5) $f(x) = x^2 - 4x - 21$

6) $y = -x^2 - 4x$

Convert the following to Vertex Form.

7) $f(x)=(x-1)(x+7)$

<u>Convert the following to Intercept Form.</u>

8) $f(x)=(x+2)^2-36$

9) Write a parabola that has a vertex at (0,1) and is vertically stretched by a factor of 2 in vertex form.

10) Write a parabola that has a vertex at the (-1,8) is vertically stretched by a factor of 2 in intercept form.

11) Write a parabola has zeros of 2 and 6, is vertically shrunk by a factor of ½ and whose end behavior approaches positive infinity in intercept form

12) If $(x+3)(x-9)=(x-h)^2+k$, then what is the value of k ?

A. $k=-36$

B. $k=-27$

C. $k=-18$

D. $k=9$

Algebra 2 Name:_____
Unit 5 – Day 9 – Parabolas Applications Period:_____Date:_____

<u>For 1 – 6, use the following.</u>

Kim wants to buy a used car with good gas mileage. He knows that the miles per gallon, or mileage, varies according to various factors, including the speed. He finds that highway mileage for the make and model he wants can be approximated by the function $\boldsymbol{f(s) = -0.03s^2 + 2.4s - 30}$, where $\boldsymbol{s}$ is the speed in miles per hour. He wants to graph this function to estimate possible gas mileages at various speeds.

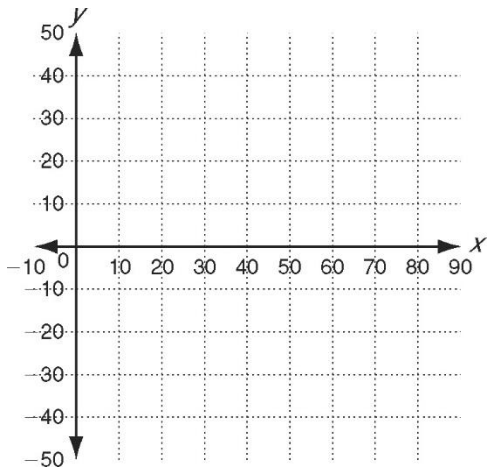
1. Determine whether the graph opens upward or downward. _____

2. Identify the axis of symmetry for the graph of the function. _____

3. Find the y-intercept. _____

4. Find the vertex. _____

5. Graph the function.



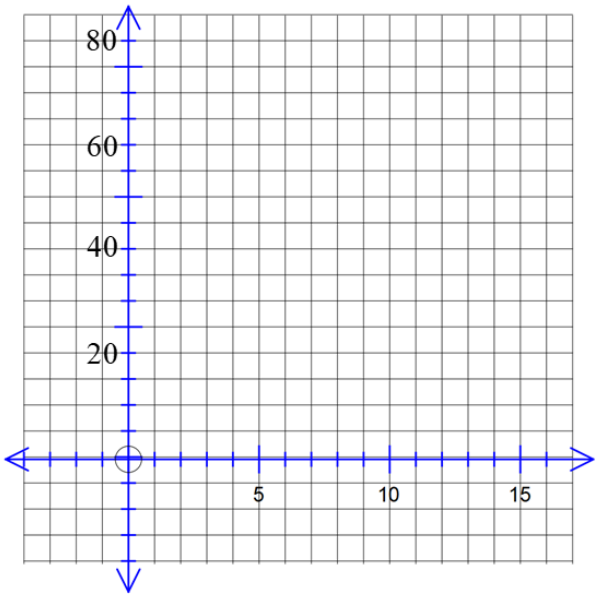
6. **a.** Does the curve have a maximum or a minimum value?

b. What is the value of the y-coordinate at the maximum or minimum?

c. Explain what this point means in terms of gas mileage.

Sean and Mason run out of gas while fishing from their boat in the bay. They set off an emergency flare with an initial vertical velocity of 30 meters per second. The height of the flare in meters can be modeled by $\boldsymbol{h(t) = -5(t-3)^2 + 45}$, where $\boldsymbol{t}$ represents the number of seconds after launch, and $\boldsymbol{h(t)}$ is the height.

7. Graph the function and answer the following.



a. How high will the flare reach?

b. How long will it take to reach that height?

c. Mason thinks that the flare will reach 15 meters in 5.4 seconds. Is he correct? Explain.

d. Sean thinks the flare should reach at least 15 meters to be seen from the shore. They want to know how long the flare will take to reach this height.

e. Sean thinks the flare will reach 15 meters sooner, but then the flare will stay above 15 meters for about 5 seconds. Is he correct? Explain.

Erin and her friends launch a rocket from ground level vertically into the air with an initial velocity of 80 feet per second. The height of the rocket, $\boldsymbol{h(t)}$, after $\boldsymbol{t}$ seconds is given by $\boldsymbol{h(t) = -16t(t-5)}$.

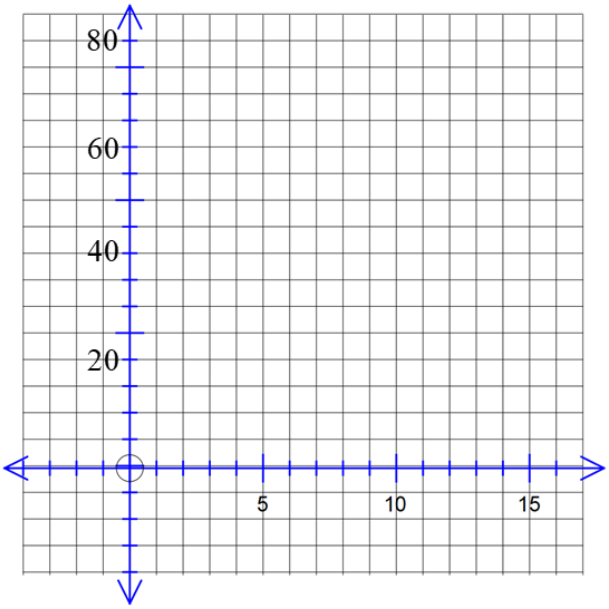
8. They want to find out how high they can expect the rocket to go and how long it will be in the air.

a. Graph the function above.

b. How long will the entire flight of the rocket last?

c. Find the number of seconds the rocket will be in the air before it starts its downward path.

d. How high can they expect their rocket to go?



9. Which function models the path of a rocket that lands 3 seconds after launch?

a. $f(x) = -16t^2 + 32t + 48$
b. $f(x) = -16t^2 + 32t + 10.5$
c. $f(x) = -16t^2 + 40t + 48$
d. $f(x) = -16t^2 + 40t + 10.5$

10. Megan reads about a rocket whose path can be modeled by the function $\boldsymbol{h(t)} = \boldsymbol{-16}(t-3)(t+1)$ Which could be the launch height?

a. 16 ft off the ground **b.** 48 ft off the ground

c. 32 ft off the ground **d.** 24 ft off the ground

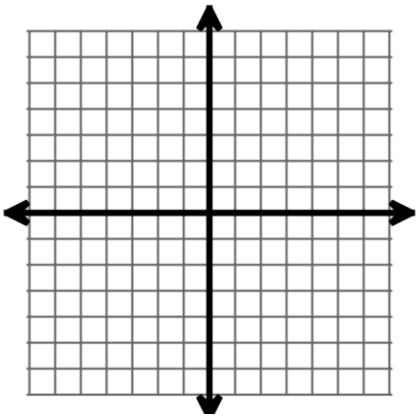
11. A stuntwoman jumps from a building 73 ft high and lands on an air bag that is 9 ft tall. Her height above ground *h* in feet can be modeled by $\boldsymbol{h(t)} = 73 - 16t^2$, where *t* is the time in seconds. How many seconds will the stuntwoman fall before touching the air bag? (*Hint:* Find the time *t* when the stuntwoman's height above ground is 9 ft.)

Algebra 2
Unit 5 – Day 10 – Systems of Equations and Inequalities

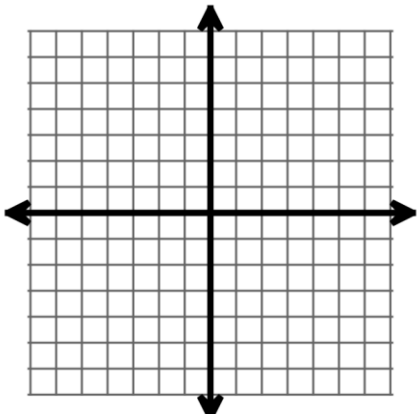
Name:_____
Period:_____Date:_____

Solve the following Systems by Graphing

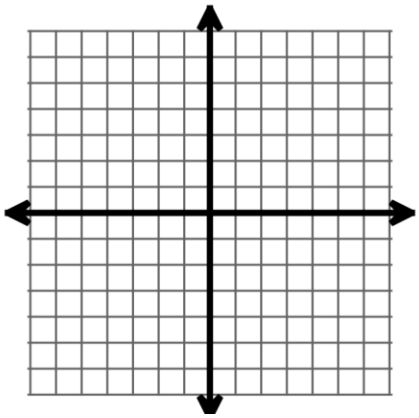
1. $y = x + 1$ **and** $y = \frac{1}{2}x - 1$



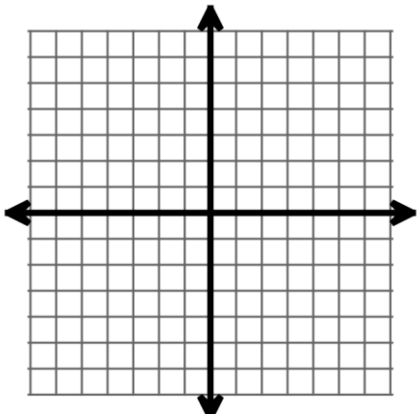
2. $y = \frac{1}{2}x - 1$ **and** $y = 3(x-6)^2 + 2$



3. $y = x + 5$ **and** $y = x^2 + 5$

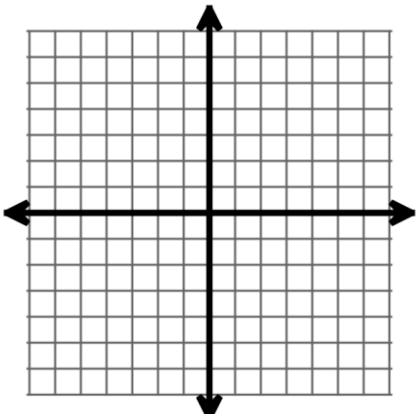


4. $y = 2x + 6$ **and** $y = -2(x+3)(x+5)$

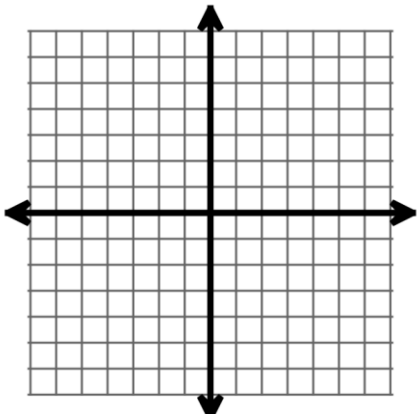


Solve the following systems of inequities.

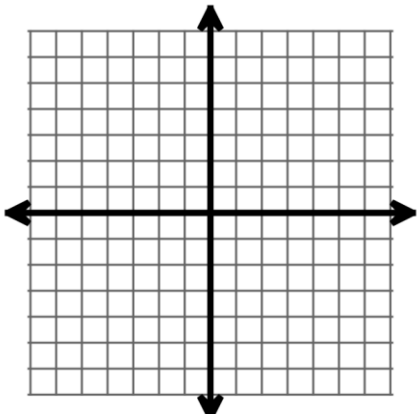
5. $y \le x - 1$ **and** $y \ge \frac{1}{2}(x-2)^2 - 3$



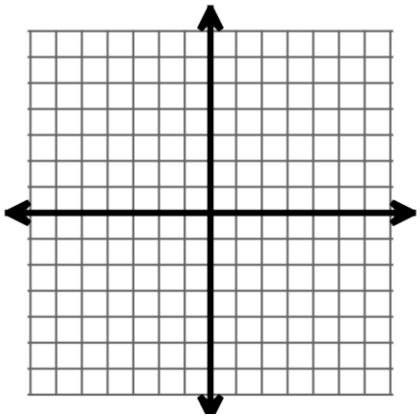
6. $x - 2 \le y$ **and** $x^2 - x - 6 \le y$



7. $y > (x+3)^2 - 5$ **and** $y \geq -(x-1)^2 + 5$



8. $y < (x-3)(x+1)$ **and** $y \leq -x^2 + x + 2$



<u>Solve the following systems algebraically.</u>

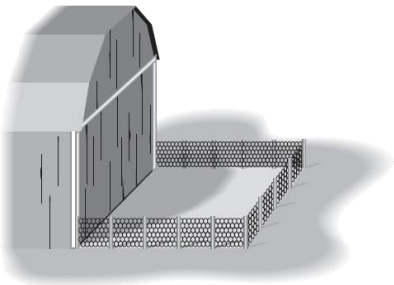
9. $4x - 2y = -16$ **and** $3x + 3y = -12$

10. $y = x^2 + 1$ **and** $3y - 3x = 3$

11. $y = x^2 - 6x + 5$ **and** $2y - 4x = 10$

12. $y = x^2 - 4$
$y = x^2 - 2x - 1$

13. A farmer has 30 feet of fence to enclose a rectangular area that borders a barn. No fence is needed along the barn. Is it possible for the farmer to enclose 112 square feet? If possible find the dimensions of the enclosure. If not, explain/prove why not.

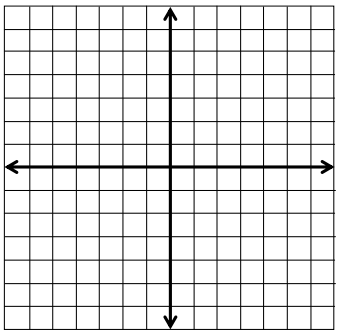


Algebra 2 Name:_____

Graphing Quadratics Review– 2021 Period:_____Date:_____

<u>Graph the following quadratic functions. Label the vertex, the axis of symmetry, state the domain and range, identify the end behavior, and zeros.</u>

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



Vertex:

Axis of Sym:

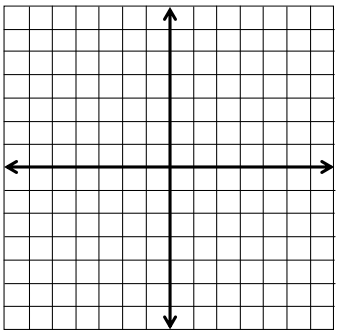
Domain:

Range:

Zeros:

$y \to$ ___ as $x \to -\infty$ and $y \to$ ___ as $x \to \infty$

2. $h(x) = \frac{1}{5}(x+4)(x-6)$



Vertex:

Axis of Sym:

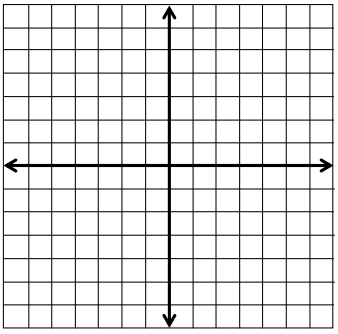
Domain:

Range:

Zeros:

$h(x) \to$ ___ as $x \to -\infty$ and $h(x) \to$ ___ as $x \to \infty$

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



Vertex:

Axis of Sym:

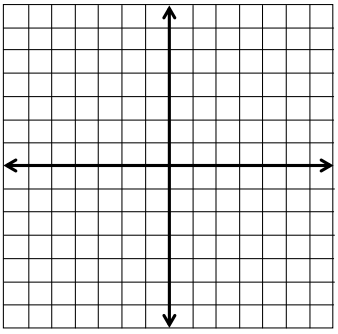
Domain:

Range:

Zeros:

$y \to$ ___ as $x \to -\infty$ and $y \to$ ___ as $x \to \infty$

4. $g(x) = x^2 - 3$



Vertex:

Axis of Sym:

Domain:

Range:

Zeros:

$g(x) \to$ ___ as $x \to -\infty$ and $g(x) \to$ ___ as $x \to \infty$

<u>Tell whether the function has a minimum or maximum value, and then find the min/max value</u>

5. $y = 2x^2 - 8x + 10$

6. $y = -\frac{1}{2}(x+4)(x-5)$

Write the following function in both vertex form and intercept form.

7. $y = x^2 + 8x + 12$

V. Form_____

I. Form_____

Write the following function in standard form and vertex form.

8. $y = -(x+2)(x-1)$

S. Form_____

V. Form_____

9. Write a parabola that has a vertex at $(-4,4)$ and is vertically stretched by a factor of -2 in **standard form.**

10. Write a parabola that has roots at -2 and 6, is vertically shrunk by a factor of $\frac{1}{3}$, and is reflected over the x-axis in **standard form.**

11. The path of a placekicked football can be modeled by the function $y = -0.026x(x-46)$ where x is the horizontal distance (in yards) and y is the corresponding height (in yards).

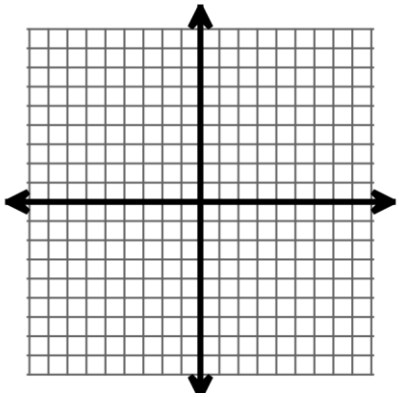
a. How far is the football kicked?

b. How high is the football kicked?

c. What is the height of the ball after it has traveled 40 yards?

12. What are the x-coordinates of the solution for the system given below?

$$\begin{cases} x^2 - y = -4x \\ 2x + y = -8 \end{cases}$$



Multiple Choice Section

13. For the function $y = -x^2 - 6x - 7$, find the vertex and the axis of symmetry.

a. Vertex (3, 2); axis of symmetry x = 3

b. Vertex (-3, 2); axis of symmetry x = 4

c. Vertex (-3, 2); axis of symmetry x = -3

d. Vertex (3, -2); axis of symmetry x = -4

14. What is the range of the following function $y = -\frac{1}{2}(x+1)(x-3)$?

a. All Real Numbers **b.** $y \le -1$ **c.** $y \le -3$ **d.** $y \le 2$

15. What are the roots of the equation $y = x^2 - 5x - 24$?

a. $-3, 8$ **b.** $3, -8$ **c.** $-5, -24$ **d.** $5, 24$ **e.** $-6, 4$

16. What is the effect on the graph of the function $y = 3x^2 + 4$ when it is changed to $y = -3x^2 + 4$?

a. The graph stretches vertically

b. The graph compresses vertically

c. The graph opens down

d. The vertex moves down the y-axis

e. The graph opens up

17. What is the end behavior of the following graph $y = -2.5x^2 - 6.8x + 9$

a. $x \to -\infty,\ f(x) \to -\infty$
$x \to +\infty,\ f(x) \to -\infty$

b. $x \to -\infty,\ f(x) \to +\infty$
$x \to +\infty,\ f(x) \to +\infty$

c. $x \to -\infty,\ f(x) \to -\infty$
$x \to +\infty,\ f(x) \to +\infty$

d. $x \to -\infty,\ f(x) \to -\infty$
$x \to +\infty,\ f(x) \to -\infty$

18. What is the vertex of $y = -3(x-2)^2 - 4$?

a. $(-2, -4)$ **b.** $(-2, 4)$ **c.** $(2, -4)$ **d.** $(2, 4)$

19. The graph of $f(x) = x^2$ is vertically compressed by a factor of $\frac{1}{2}$ and translated to the right three units and down one unit to produce the function $g(x)$. Which of the following equations represents $g(x)$?

a. $g(x) = -\frac{1}{2}(x+3)^2 + 1$

b. $g(x) = -\frac{1}{2}(x+1)^2 + 3$

c. $g(x) = \frac{1}{2}(x-3)^2 - 1$

d. $g(x) = \frac{1}{2}(x-1)^2 - 3$

20. Which of following functions does **<u>not</u>** represent the parabola with a vertex at $(1, 4)$ and x-intercepts $(-1, 0)$ and $(3, 0)$.

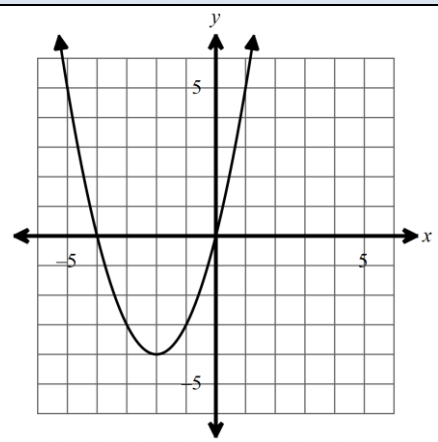
a. $f(x) = -(x-1)^2 + 4$

b. $f(x) = -x^2 + x + 4$

c. $f(x) = -x^2 + 2x + 3$

d. $f(x) = -(x+1)(x-3)$

21. Compare the two functions represented below. Determine which of the following statements is true.

Function $f(x)$	Function $g(x)$
	$g(x) = (x-6)^2 - 4$

a. The functions have the same vertex.

b. The minimum value of $f(x)$ is the same as the minimum value of $g(x)$.

c. The functions have the same axis of symmetry.

d. The minimum value of $f(x)$ is less than the minimum value of $g(x)$.

22. Which of the following statements describe key features of $f(x) = x^2 + 2x + 7$? Select **<u>all</u>** that apply.

a. The y-intercept is $(0, 7)$.

b. The vertex is $(2, 7)$.

c. The axis of symmetry is $x = -1$.

d. The y-intercept is $(0, 2)$.

e. The minimum is $y = 6$.

f. The vertex is $(-1, 6)$.

g. The minimum is $y = 7$.

h. The axis of symmetry is $x = 2$.