

Name _____

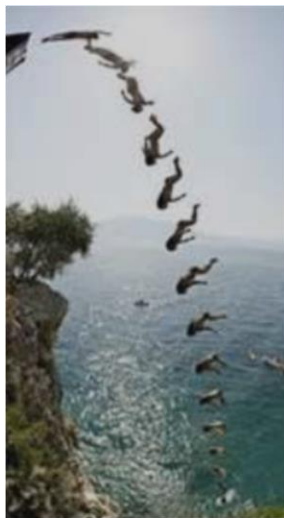
Beaumont Middle School
8th Grade, 2017-2018
Advanced Algebra I

QUADRATIC APPLICATIONS

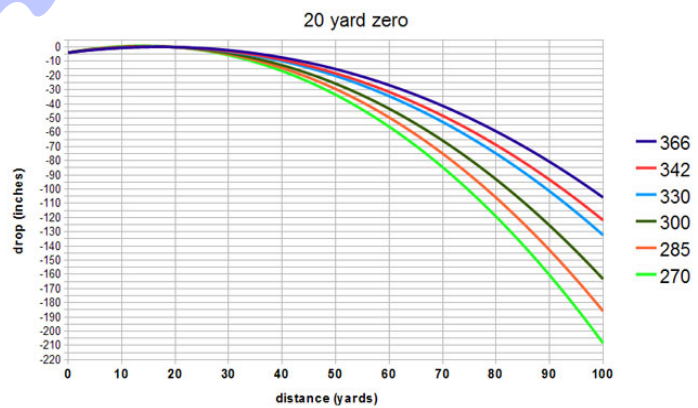
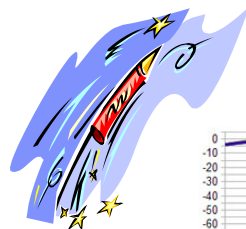
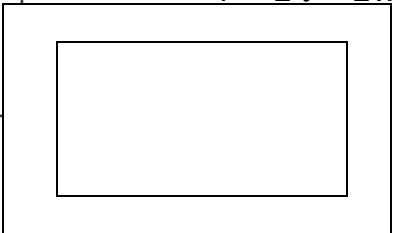


$$A = \ell w$$

$$P = 2\ell + 2w$$



- Steps to Graph Quadratic Functions (Parabolas)
- 1st Transform the equation into standard form. $y = ax^2 + bx + c$
 - 2nd State what $a = \underline{\quad}$, $b = \underline{\quad}$, and $c = \underline{\quad}$.
 - 3rd Find the axis of symmetry $x = \frac{-b}{2a}$
 - 4th Remember if a is positive, the graph turns upward
If a is negative, the graph turns downward
 - 5th Find the vertex. Substitute the x -value from the axis of symmetry into the original equation to find the y -value.
 - 6th The y -intercept is c .

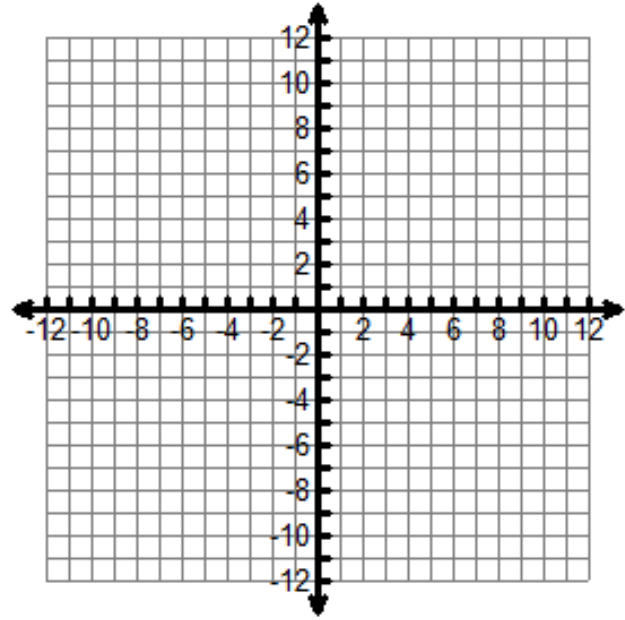


Graphing Quadratic Functions, Using the Zeroes (x-intercepts)

EXAMPLES

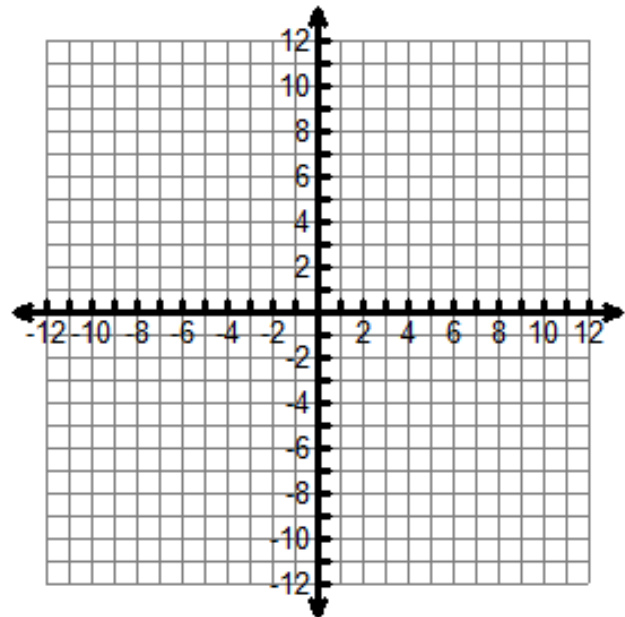
1) $y = x^2 - 9$

- Standard Form: _____
- $a = \underline{\hspace{1cm}}$, $b = \underline{\hspace{1cm}}$, and $c = \underline{\hspace{1cm}}$.
- axis of symmetry: _____
- upward or downward?
- vertex: _____
- y-intercept: _____
- Factored form of related function: _____
- x-intercepts: _____
- Sketch the graph.



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

- Standard Form: _____
- $a = \underline{\hspace{1cm}}$, $b = \underline{\hspace{1cm}}$, and $c = \underline{\hspace{1cm}}$.
- axis of symmetry: _____
- upward or downward?
- vertex: _____
- y-intercept: _____
- Factored form of related function: _____
- x-intercepts: _____
- Sketch the graph



Practice

Sketch each graph.

1) $y = x^2 - 2x - 8$

a) Standard Form: _____

b) $a = \underline{\quad}$, $b = \underline{\quad}$, and $c = \underline{\quad}$.

c) axis of symmetry: _____

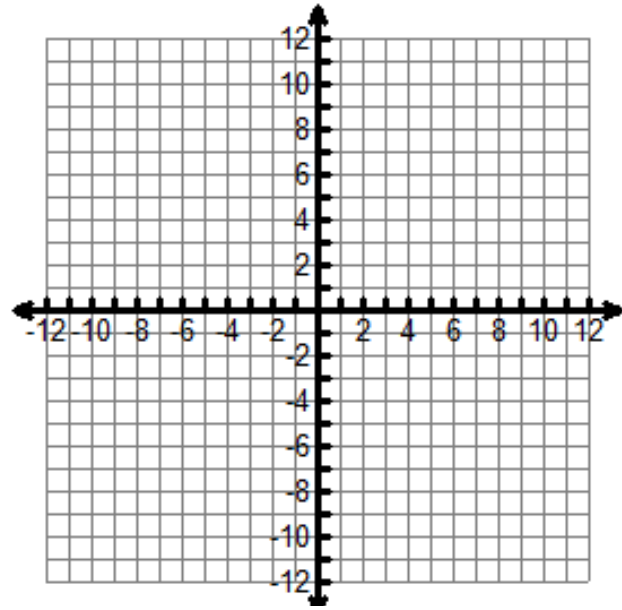
d) upward or downward?

e) vertex: _____

f) y-intercept: _____

g) Factored form of related function: _____

h) x-intercepts: _____



2) $y = -x^2 - 4x + 5$

a) Standard Form: _____

b) $a = \underline{\quad}$, $b = \underline{\quad}$, and $c = \underline{\quad}$.

c) axis of symmetry: _____

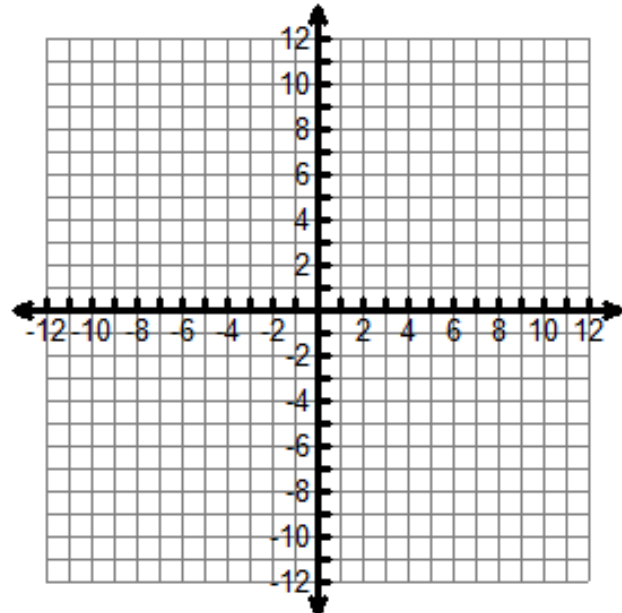
d) upward or downward?

e) vertex: _____

f) y-intercept: _____

g) Factored form of related function: _____

h) x-intercepts: _____



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

a) Standard Form: _____

b) $a = \underline{\quad}$, $b = \underline{\quad}$, and $c = \underline{\quad}$.

c) axis of symmetry: _____

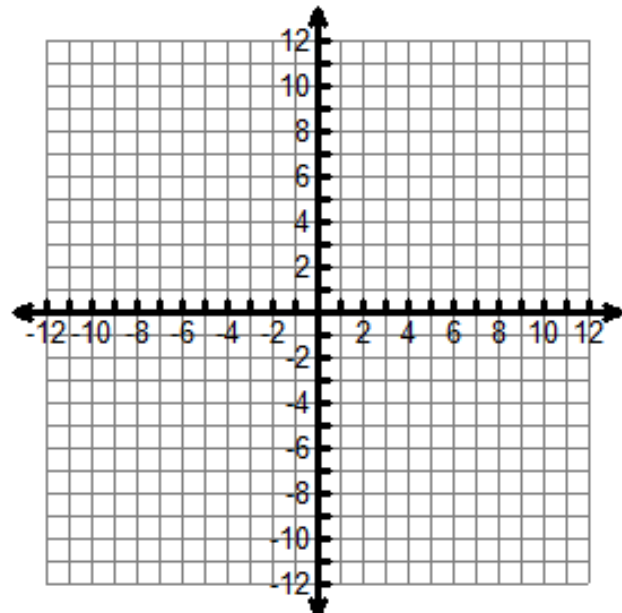
d) upward or downward?

e) vertex: _____

f) y-intercept: _____

g) Factored form of related function: _____

h) x-intercepts: _____



4) $x^2 + 7 - 8x = y$

a) Standard Form: _____

b) $a = \underline{\quad}$, $b = \underline{\quad}$, and $c = \underline{\quad}$.

c) axis of symmetry: _____

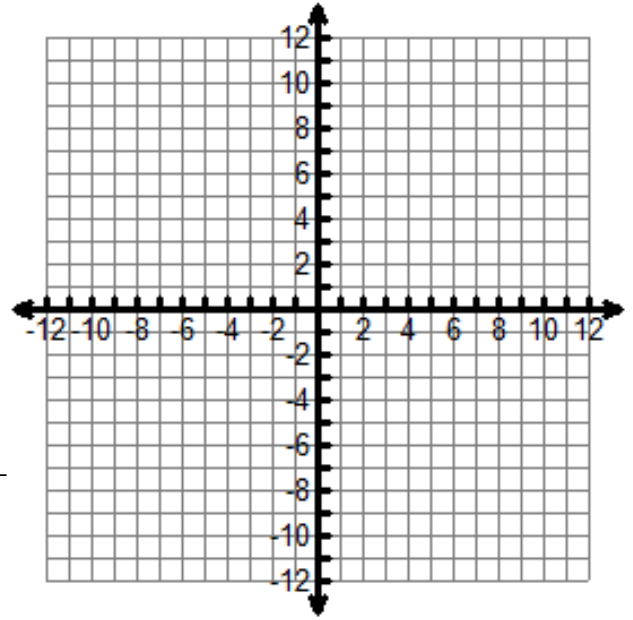
d) upward or downward?

e) vertex: _____

f) y-intercept: _____

g) Factored form of related function: _____

h) x-intercepts: _____



5) $y = -12 - x^2 + 8x$

a) Standard Form: _____

b) $a = \underline{\quad}$, $b = \underline{\quad}$, and $c = \underline{\quad}$.

c) axis of symmetry: _____

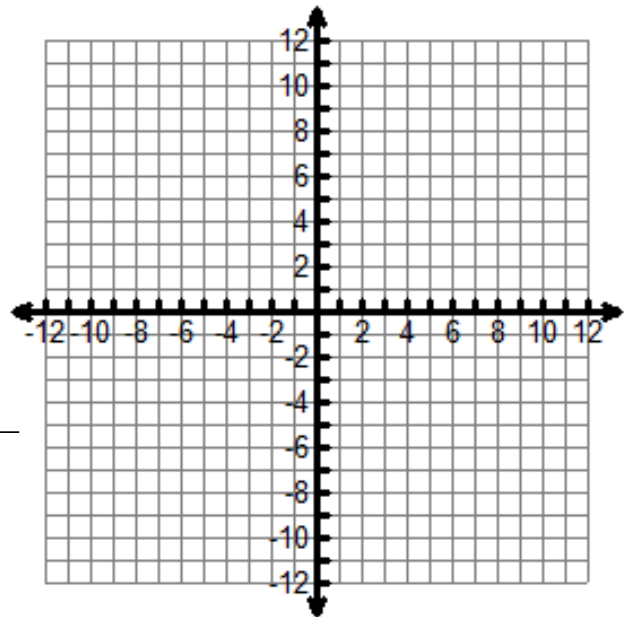
d) upward or downward?

e) vertex: _____

f) y-intercept: _____

g) Factored form of related function: _____

h) x-intercepts: _____



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

a) Standard Form: _____

b) $a = \underline{\quad}$, $b = \underline{\quad}$, and $c = \underline{\quad}$.

c) axis of symmetry: _____

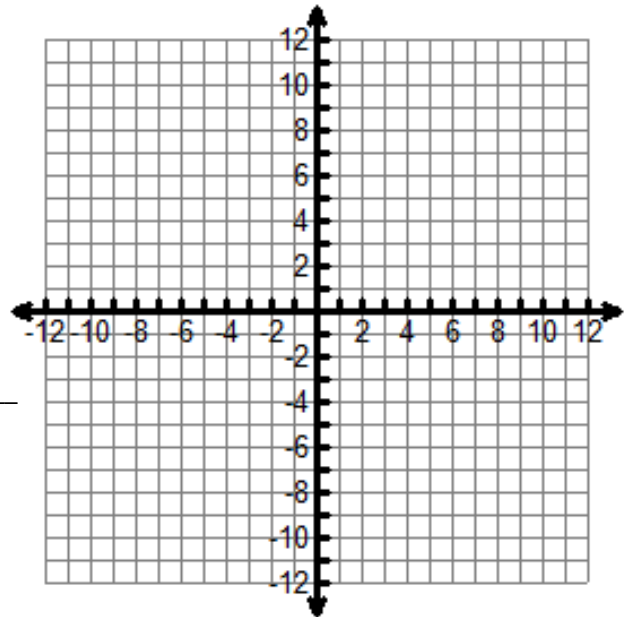
d) upward or downward?

e) vertex: _____

f) y-intercept: _____

g) Factored form of related function: _____

h) x-intercepts: _____



Graphing Quadratic Functions; Using a Table

EXAMPLES

Sketch each graph.

1) $y + x^2 = 8x - 4$

a) Standard Form: _____

b) $a = \underline{\quad}$, $b = \underline{\quad}$, and $c = \underline{\quad}$.

c) axis of symmetry: _____

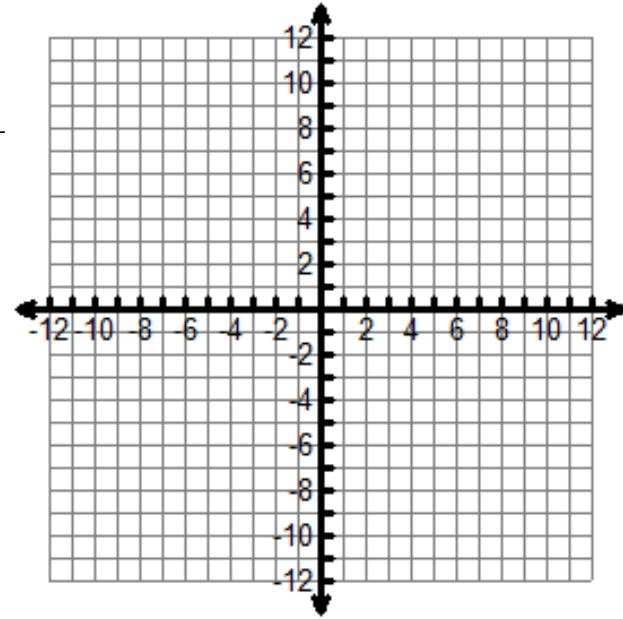
d) upward or downward?

e) vertex: _____

f) y-intercept: _____

g) Complete the table with additional points.
(You choose the x-values.)

x	f(x) =	f(x)



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

a) Standard Form: _____

b) $a = \underline{\quad}$, $b = \underline{\quad}$, and $c = \underline{\quad}$.

c) axis of symmetry: _____

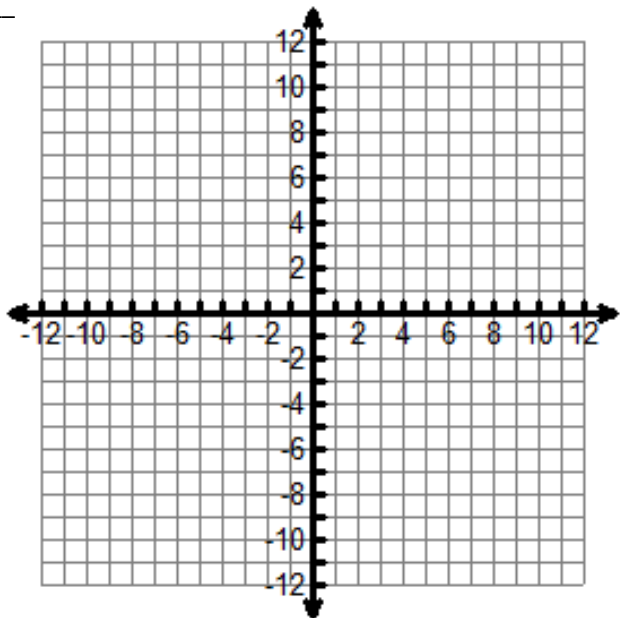
d) upward or downward?

e) vertex: _____

f) y-intercept: _____

g) Complete the table with additional points.
(You choose the x-values.)

x	f(x) =	f(x)



Assignment

1) $y - x^2 = -2x + 5$

Sketch each graph.

a) Standard Form: _____

b) $a = \underline{\quad}$, $b = \underline{\quad}$, and $c = \underline{\quad}$.

c) axis of symmetry: _____

d) upward or downward?

e) vertex: _____

f) y-intercept: _____

g) Complete the table with two additional points.
(You choose the x-values.)

x	f(x) =	f(x)

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

a) Standard Form: _____

b) $a = \underline{\quad}$, $b = \underline{\quad}$, and $c = \underline{\quad}$.

c) axis of symmetry: _____

d) upward or downward?

e) vertex: _____

f) y-intercept: _____

g) Complete the table with two additional points.
(You choose the x-values.)

x	f(x) =	f(x)

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

a) Standard Form: _____

b) $a = \underline{\quad}$, $b = \underline{\quad}$, and $c = \underline{\quad}$.

c) axis of symmetry: _____

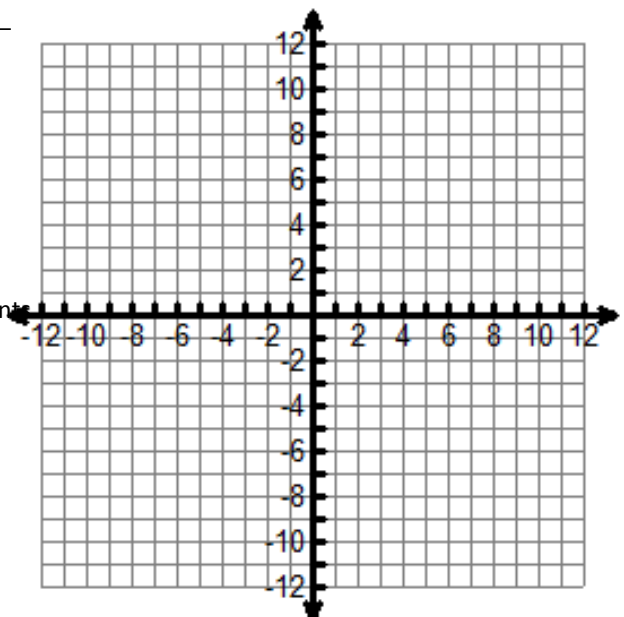
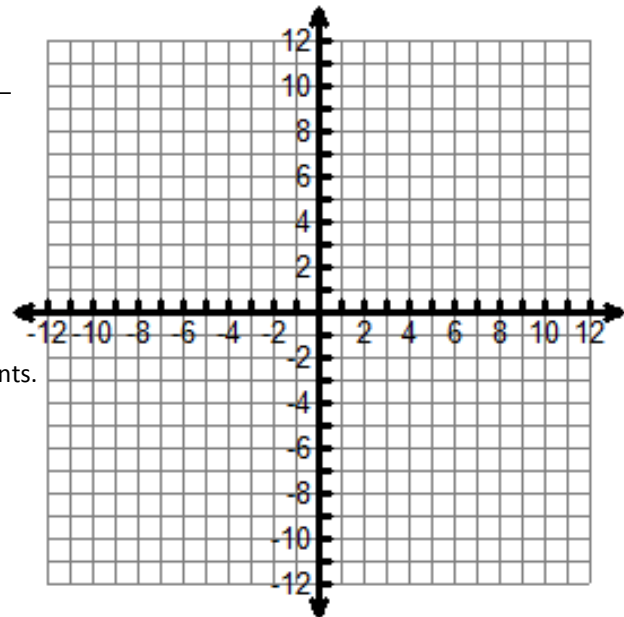
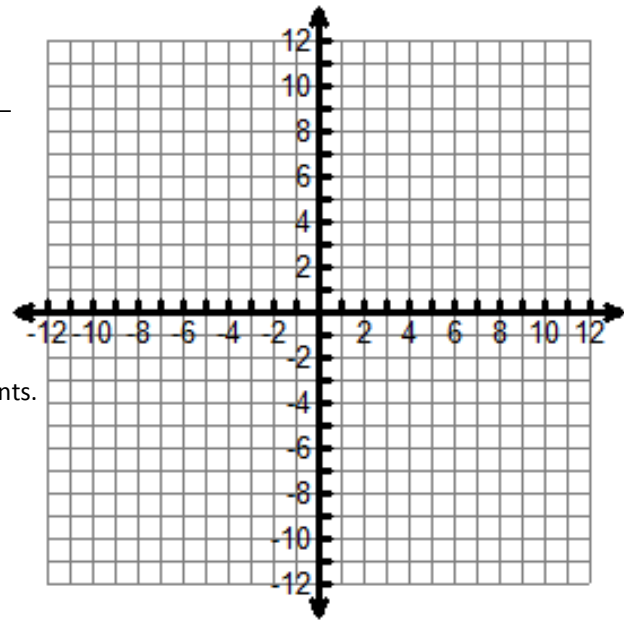
d) upward or downward?

e) vertex: _____

f) y-intercept: _____

g) Complete the table with two additional points.
(You choose the x-values.)

x	f(x) =	f(x)



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

a) Standard Form: _____

b) $a = \underline{\quad}$, $b = \underline{\quad}$, and $c = \underline{\quad}$.

c) axis of symmetry: _____

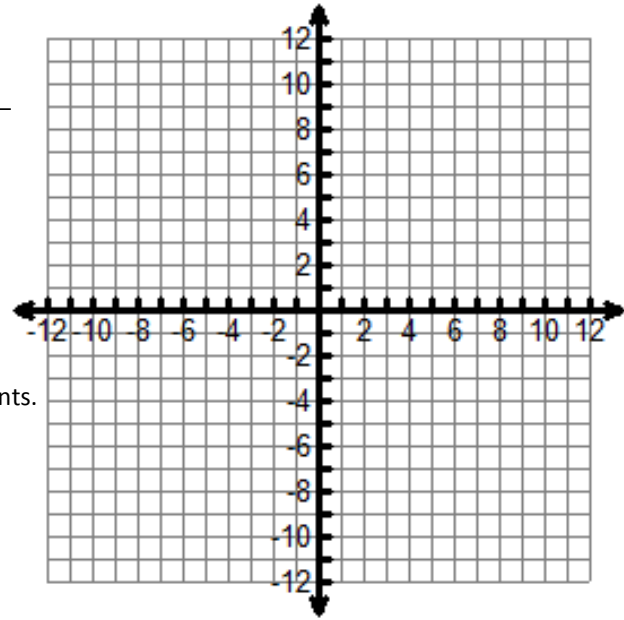
d) upward or downward?

e) vertex: _____

f) y-intercept: _____

g) Complete the table with two additional points.
(You choose the x-values.)

x	f(x) =	f(x)



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

a) Standard Form: _____

b) $a = \underline{\quad}$, $b = \underline{\quad}$, and $c = \underline{\quad}$.

c) axis of symmetry: _____

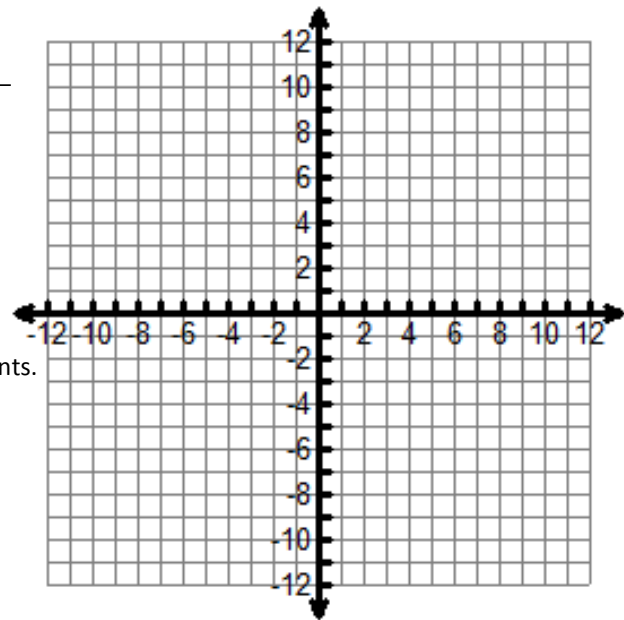
d) upward or downward?

e) vertex: _____

f) y-intercept: _____

g) Complete the table with two additional points.
(You choose the x-values.)

x	f(x) =	f(x)



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

a) Standard Form: _____

b) $a = \underline{\quad}$, $b = \underline{\quad}$, and $c = \underline{\quad}$.

c) axis of symmetry: _____

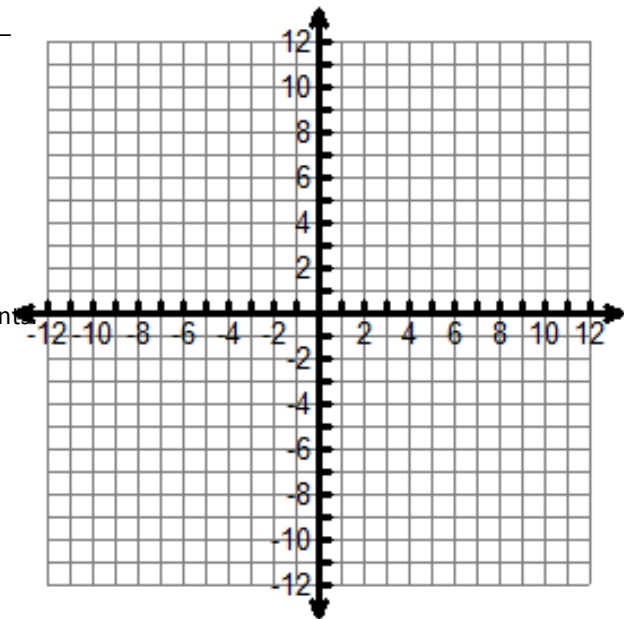
d) upward or downward?

e) vertex: _____

f) y-intercept: _____

g) Complete the table with two additional points.
(You choose the x-values.)

x	f(x) =	f(x)

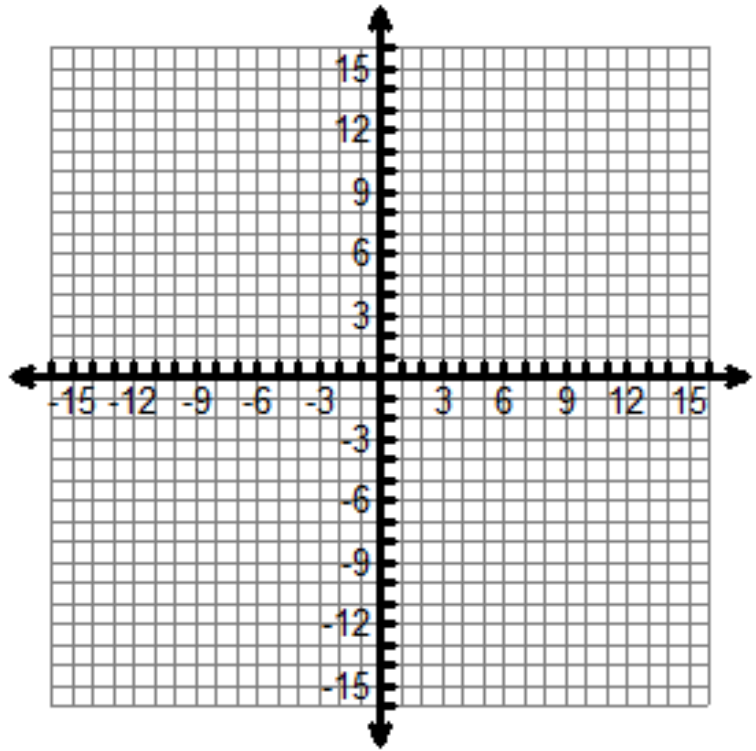


Review:

Graph the following quadratic function using the axis of symmetry, vertex and intercepts.

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

- a) Standard Form: _____
- b) $a =$ _____, $b =$ _____, and $c =$ _____.
- c) axis of symmetry: _____
- d) upward or downward?
- e) vertex: _____
- f) y-intercept: _____
- g) Factored form of related function: _____
- h) x-intercepts: _____
- g) Sketch the graph. Label the axis of symmetry, vertex and intercepts

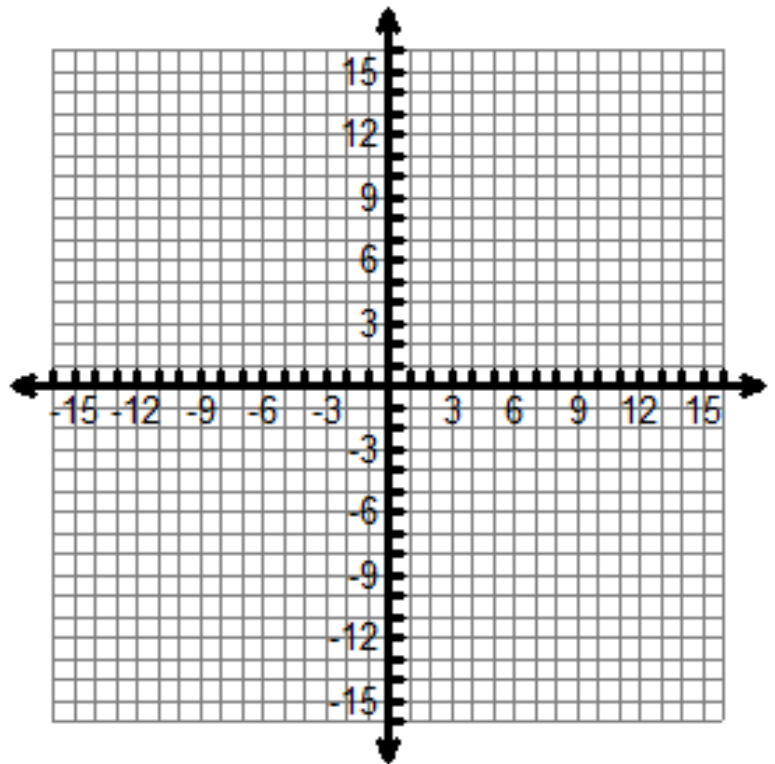


2) Graph the following quadratic function using the axis of symmetry, vertex and 2 other points.

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

- a) Standard Form: _____
- b) $a =$ _____, $b =$ _____, and $c =$ _____.
- c) axis of symmetry: _____
- d) upward or downward?
- e) vertex: _____
- f) y-intercept: _____
- g) Complete the table with additional points.
(You choose the x-values.)

x	f(x) =	f(x)



Using Factoring to Solve Problems

For each problem, define the variable, draw a diagram as indicated, write an equation(s), and solve.

Projectiles, Finding Time

When height, h , is in feet: $h = -16t^2 + vt + c$

When height, h , is in meters: $h = -4.9t^2 + vt + c$

t is the time in motion (in seconds)

v is the initial upward velocity (in ft/sec or m/sec)

c is the initial height

EXAMPLES

1) A diver springs from the edge of a cliff 80 ft above the ocean with an initial velocity of 8 ft/sec. How long will it take the diver to reach the water?

Variable: _____

Diagram: ↓

Equation: _____



Solution: _____

2) An object is launched at 19.6 meters per second (m/s) from a 58.8-meter tall platform. When does the object strike the ground?

Variable: _____

Diagram: ↓

Equation: _____

Solution: _____

3) At a pep rally, cheerleaders use a slingshot to launch small, foam basketballs into the crowd. The release point is 5 ft above the gym floor, and the balls are shot with an initial upward velocity of 52 ft/s. Suppose a ball is caught 17 ft above the floor on its way down by a student in the stands. How long is the ball in the air?

Variable: _____

Diagram: ↓

Equation: _____

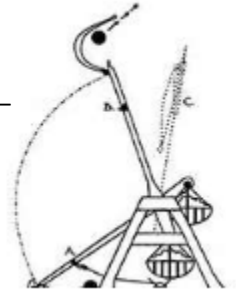
Solution: _____

4) A trebuchet launches a projectile on a parabolic arc at a velocity of 147m/s. Determine when the projectile will first reach a height of 980 m, and how many seconds later will it again be 980m.

Variable: _____

Diagram: ↓

Equation: _____



Solution: _____

ASSIGNMENT

1) Bryson throws a baseball into the air with an initial velocity of 46 ft/s. He releases the ball 6 feet off of the ground. When will the ball hit the ground?

Variable: _____

Diagram: ↓

Equation: _____



Solution: _____

2) An object is launched from ground level directly upward at 39.2 m/s. For how long is the object at or above a height of 34.3 meters?

Variable: _____

Diagram: ↓

Equation: _____

Solution: _____

3) At a pep rally, cheerleaders use a slingshot to launch t-shirts into the crowd. The release point is 5 ft above the gym floor, and the t-shirts are shot with an initial upward velocity of 36 ft/s. Suppose a t-shirt is caught 13 ft above the floor on its way down by a student in the stands. How long is the t-shirt in the air?

Variable: _____

Diagram: ↓

Equation: _____

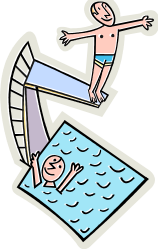
Solution: _____

4) A diver is standing on a platform 24 ft. above the pool. He jumps from the platform with an initial upward velocity of 8ft/s. How long will it take for him to hit the water?

Variable: _____

Diagram: ↓

Equation: _____



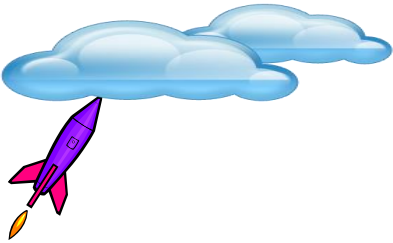
Solution: _____

5) An amateur rocketry club is holding a competition. There is a cloud cover at 1470 m. If a rocket is launched with a velocity of 196 m/s, determine how long the rocket is out of sight.

Variable: _____

Diagram: ↓

Equation: _____



Solution: _____

6) A circus acrobat is shot out of a cannon with an initial upward speed of 50 ft/s. If the acrobat leaves the cannon 4 ft above the ground, how long will it take him to reach a net that is 10 ft above the ground?

Variable: _____

Diagram: ↓

Equation: _____



Solution: _____

7) A trapeze artist is shot out of a cannon with an initial upward speed of 34 ft/sec. If the acrobat leaves the cannon 4 ft above the ground, how long will it take her to reach a net that is 8 ft above the ground?

Variable: _____

Diagram: ↓

Equation: _____

Solution: _____

8) An arrow is shot upward with an initial speed of 34.3 m/s. When will it be at a height of 49m?

Variable: _____

Diagram: ↓

Equation: _____



Solution: _____

11) Graph the following quadratic function using the axis of symmetry, vertex and intercepts.

$$y = -5 + 4x + x^2$$

a) Standard Form: _____

b) $a =$ _____, $b =$ _____, and $c =$ _____.

c) axis of symmetry: _____

d) upward or downward?

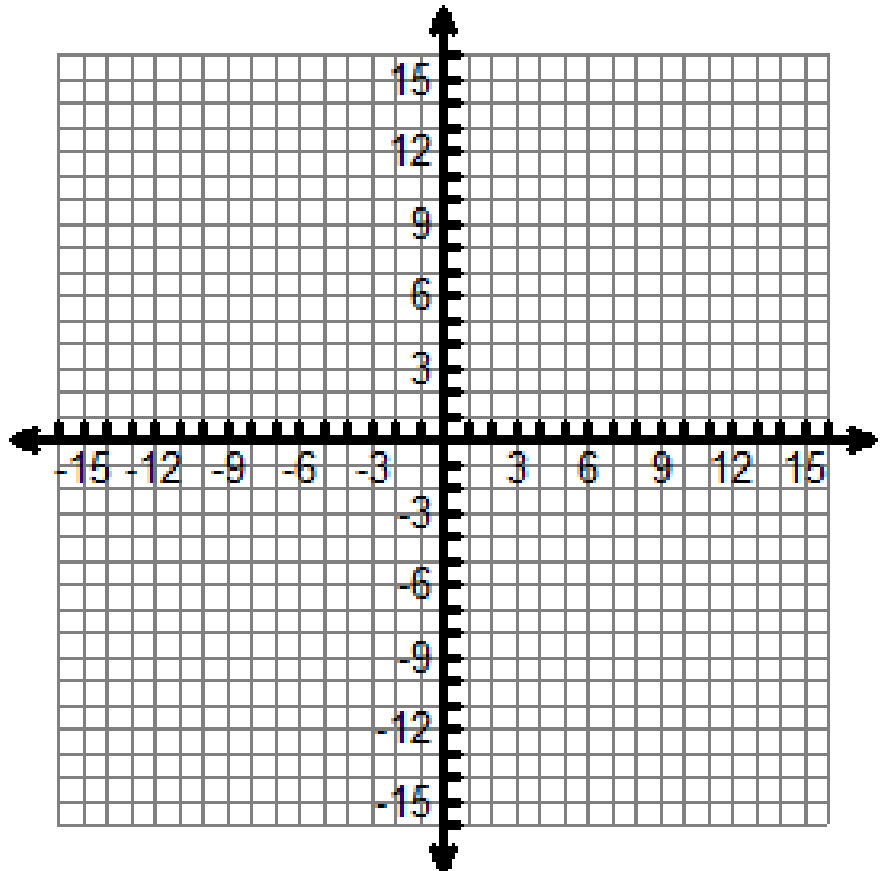
e) vertex: _____

f) y-intercept: _____

g) Factored form of related function: _____

h) x-intercepts: _____

g) Sketch the graph.



12) Graph the following quadratic function using the axis of symmetry, vertex and 2 other points.

$$\frac{1}{2}x^2 - 10 + y = 3x$$

a) Standard Form: _____

b) $a =$ _____, $b =$ _____, and $c =$ _____.

c) axis of symmetry: _____

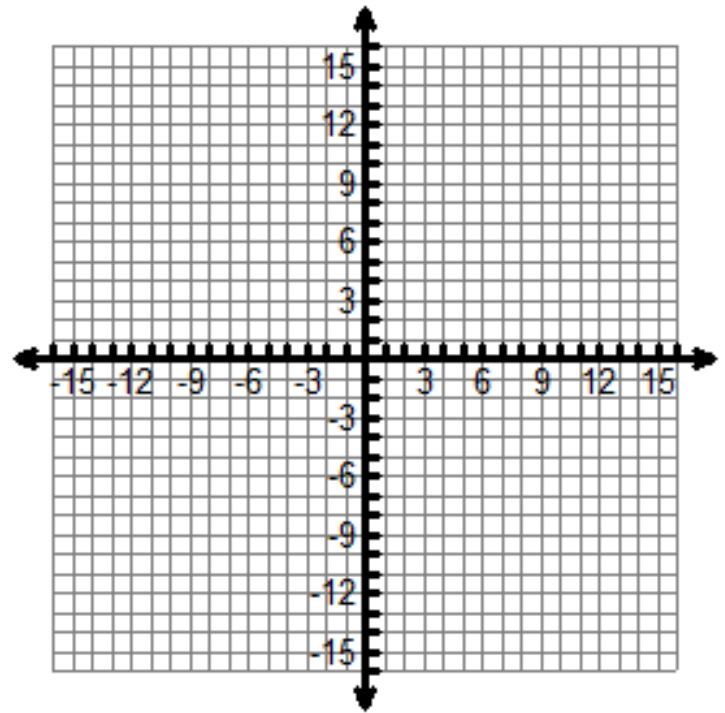
d) upward or downward?

e) vertex: _____

f) y-intercept: _____

g) Complete the table with additional points.
(You choose the x-values.)

x	f(x) =	f(x)



Using Factoring to Solve Problems

For each problem, define the variable, draw a diagram as indicated, write an equation(s), and solve.

Projectiles, Finding Maximum Height

The **maximum height** will be at the **vertex** of the graph, where $x = \text{time}$ and $y = \text{height}$. $x = \frac{-b}{2a}$

When height, h , is in feet: $h = -16t^2 + vt + c$

t is the time in motion (in seconds)

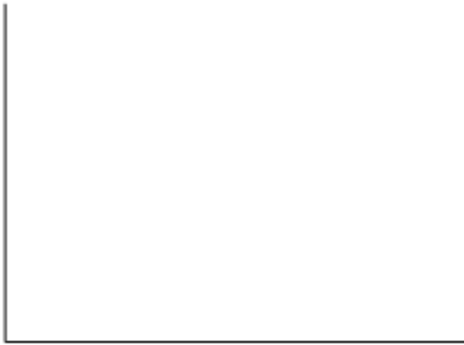
v is the initial upward velocity (in ft/sec or m/sec)

c is the initial height

EXAMPLES

1) Chris jumped off of a cliff with an initial velocity of 16 ft/s into the ocean in Acapulco while vacationing with some friends. The cliff was 480 ft above the ocean.

Sketch the graph of Eli's jump as a function of his height over time. Label all important information as you answer each question.



Function $h(t) =$ _____

$a =$ _____ $b =$ _____ $c =$ _____

a) **How long did it take for Eli to reach his maximum height?** Variable: _____ Equation: _____

Solution: _____

b) **What was the highest point that Eli reached?** Variable: _____ Equation: _____

Solution: _____

c) **Eli hit the water after how many seconds?** Variable: _____ Equation: _____

Solution: _____

2) Some fireworks are fired vertically into the air from the ground at an initial velocity of 80 feet per second. When the highest point is reached by the firework –it explodes. Function $h(t) =$ _____

$$a = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}} \quad c = \underline{\hspace{2cm}}$$

a) After how many seconds does the firework explode? Variable: _____ Equation: _____

Solution: _____

b) What is the height of the firework when it explodes? Variable: _____ Equation: _____

Solution: _____

3) If a toy rocket is launched vertically upward from ground level with an initial velocity of 128 feet per second, then its height, h after t seconds is given by the equation $h(t) = -16t^2 + 128t$ (if air resistance is neglected.)

Sketch the graph of the rockets' path as a function of his height over time. Label all important information as you answer each question.



$$\text{Function } h(t) = \underline{\hspace{4cm}}$$

$$a = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}} \quad c = \underline{\hspace{2cm}}$$

a. How long will it take for the rocket to return to the ground? Variable: _____ Equation: _____

Solution: _____

b. For how many seconds will the rocket be 112 feet above the ground? Variable: _____ Equation: _____

Solution: _____

c. How long will it take the rocket to reach its maximum height? Variable: _____ Equation: _____

Solution: _____

d. What is the maximum height? Variable: _____ Equation: _____

Solution: _____

ASSIGNMENT

1) A ball is launched directly upward at 64 feet per second (ft/s) from a platform 80 feet high.

Function $h(t) =$ _____

$a =$ _____ $b =$ _____ $c =$ _____

a) **When will the ball reach its' maximum height?** Variable: _____ Equation: _____

Solution: _____

b) **What will be the ball's maximum height?** Variable: _____ Equation: _____

Solution: _____

2) Ben and Sheldon are hiking in the mountains. Ben wants to climb to a ledge that is 20 ft. above him. The height of the grappling hook he throws is given by the function $h(t) = -16t^2 + 32t + 5$.

a) **From the equations, what is the initial velocity of the grappling hook that Ben throws?** $a =$ _____ $b =$ _____ $c =$ _____

b) **When will the grappling hook reach its' maximum height?** Variable: _____ Equation: _____

Solution: _____

c) **Can Ben throw it high enough to reach the ledge?** Variable: _____ Equation: _____

Solution: _____

Justify your answer. _____

3) A tennis ball is propelled upward from the face of a racket at 40 feet per second. The racket face is 3 feet above ground when it makes contact with the ball.

Function $h(t) =$ _____

$a =$ _____ $b =$ _____ $c =$ _____

a) **At what time will the ball be at its highest point?** Variable: _____ Equation: _____

Solution: _____

b) **How high is that highest point?** Variable: _____ Equation: _____

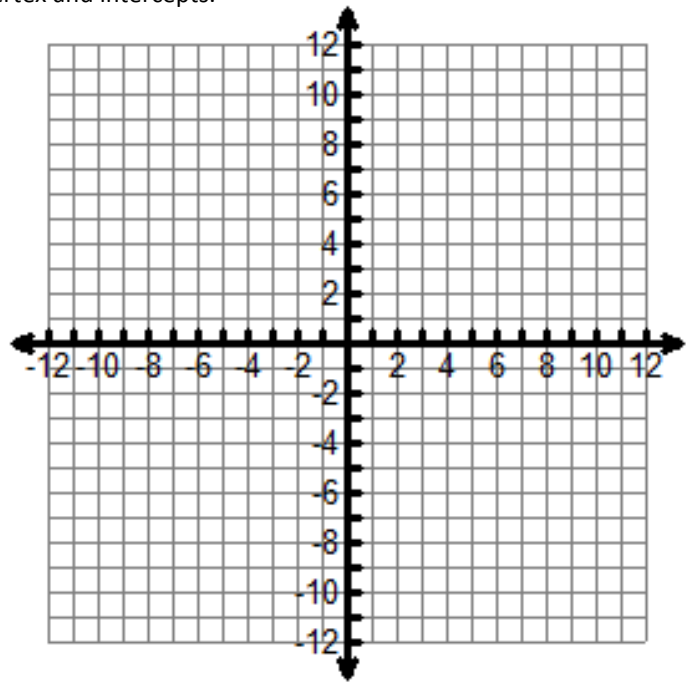
Solution: _____

Review:

4) Graph the following quadratic function using the axis of symmetry, vertex and intercepts.

$$y = 12 - 8x + x^2$$

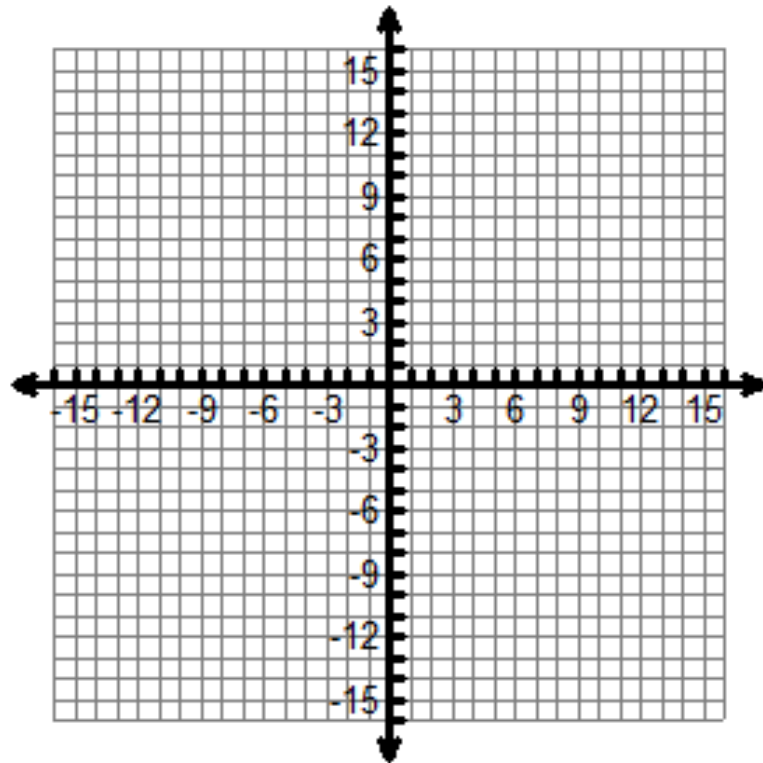
- a) Standard Form: _____
- b) $a =$ _____, $b =$ _____, and $c =$ _____.
- c) axis of symmetry: _____
- d) upward or downward?
- e) vertex: _____
- f) y-intercept: _____
- g) Factored form of related function: _____
- h) x-intercepts: _____
- g) Sketch the graph.



5) Graph the following quadratic function using the axis of symmetry, vertex and 2 other points.

$$\frac{1}{2}x^2 - 10 + y = -2x$$

- a) Standard Form: _____
- b) $a =$ _____, $b =$ _____, and $c =$ _____.
- c) axis of symmetry: _____
- d) upward or downward?
- e) vertex: _____
- f) y-intercept: _____
- g) Complete the table with additional points.
(You choose the x-values.)



x	f(x) =	f(x)

When height, h , is in feet: $h(t) = -16t^2 + vt + c$

When height, h , is in meters: $h(t) = -4.9t^2 + vt + c$

t is the time in motion (in seconds)

v is the initial upward velocity (in ft/sec or m/sec)

c is the initial height

12) Emily springs for a dive off the edge of a cliff 120 ft above the ocean with an initial upward velocity of 8 ft/s. How long will it take the Emily to reach the water?

Variable: _____

Diagram: ↓

Equation: _____

Solution: _____

13) An object is launched from ground level directly upward at 44.1 m/s. For how long is the object at or above a height of 39.2 meters?

Variable: _____

Diagram: ↓

Equation: _____

Solution: _____