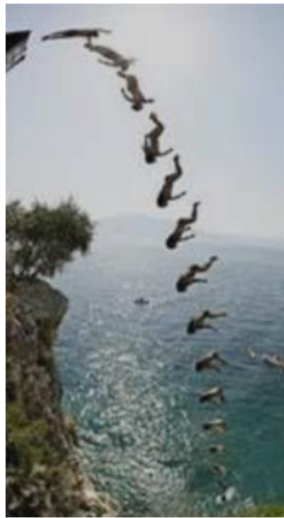


Name \_\_\_\_\_

Beaumont Middle School  
8th Grade, 2015-2016  
Advanced Algebra I

# QUADRATIC APPLICATIONS

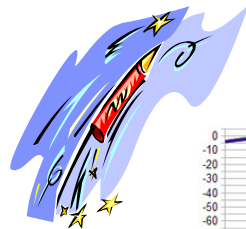
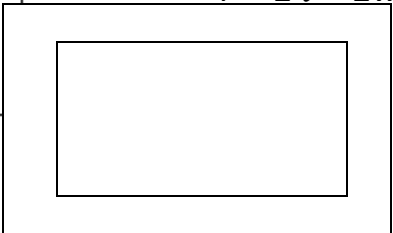


Steps to Graph Quadratic Functions (Parabolas)

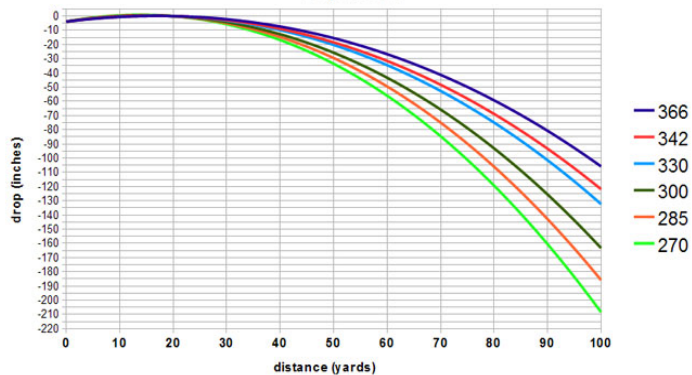
- 1<sup>st</sup> Transform the equation into standard form.  $y = ax^2 + bx + c$
- 2<sup>nd</sup> State what  $a =$  \_\_\_\_,  $b =$  \_\_\_\_, and  $c =$  \_\_\_\_.
- 3<sup>rd</sup> Find the axis of symmetry  $x = \frac{-b}{2a}$
- 4<sup>th</sup> Remember if  $a$  is positive, the graph turns upward  
if  $a$  is negative, the graph turns downward
- 5<sup>th</sup> Find the vertex. Substitute the  $x$ -value from the axis of symmetry into the original equation to find the  $y$ -value.
- 6<sup>th</sup> The  $y$ -intercept is  $c$ .

$$A = \ell w$$

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



20 yard zero

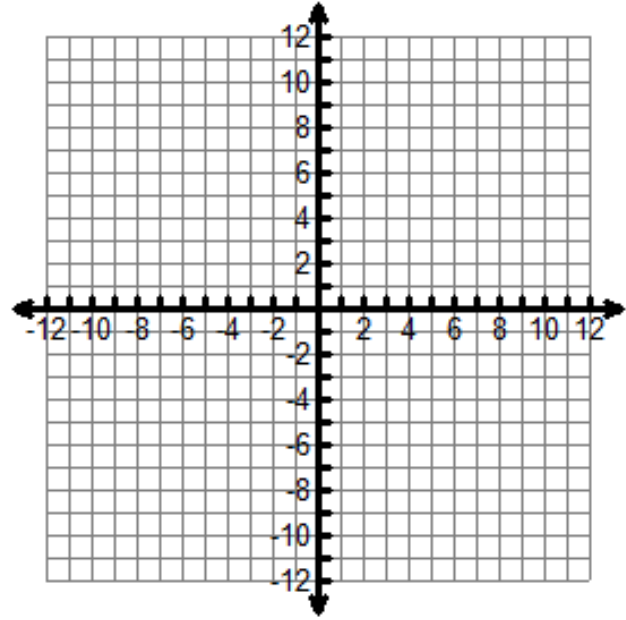


## Graphing Quadratic Functions, Using the Zeroes (x-intercepts)

### EXAMPLES

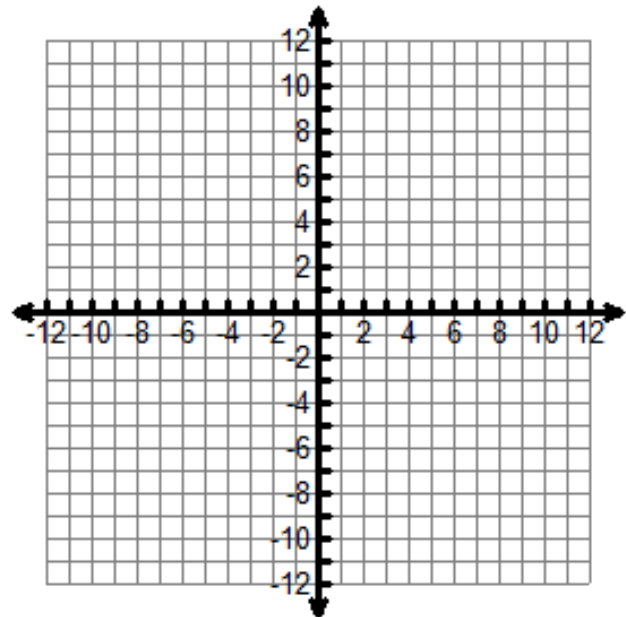
1)  $y = x^2 - 9$

- Standard Form: \_\_\_\_\_
- $a = \underline{\quad}$ ,  $b = \underline{\quad}$ , and  $c = \underline{\quad}$ .
- 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: \_\_\_\_\_
- $a = \underline{\quad}$ ,  $b = \underline{\quad}$ , and  $c = \underline{\quad}$ .
- 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: \_\_\_\_\_

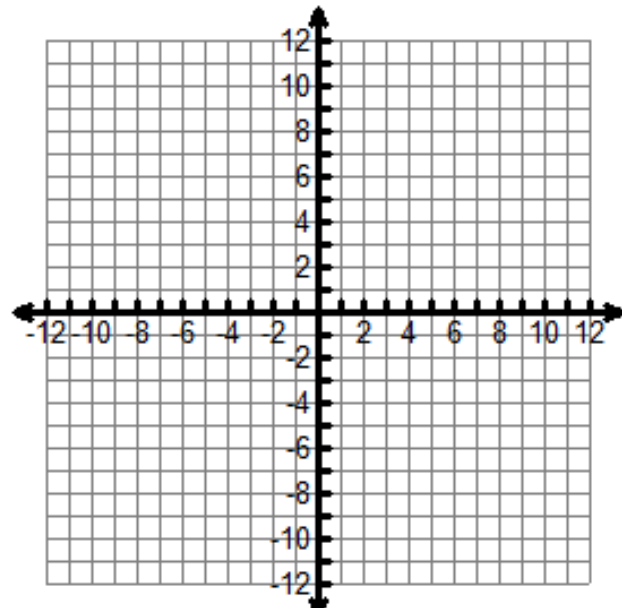
d) upward or downward?

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: \_\_\_\_\_

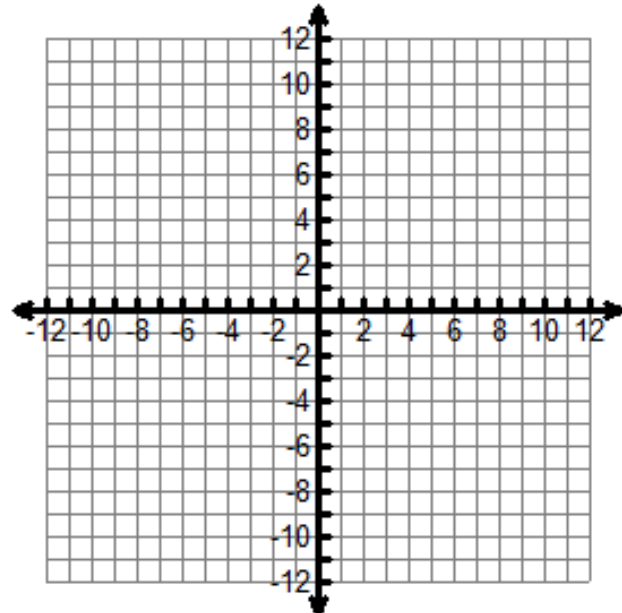
d) upward or downward?

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: \_\_\_\_\_

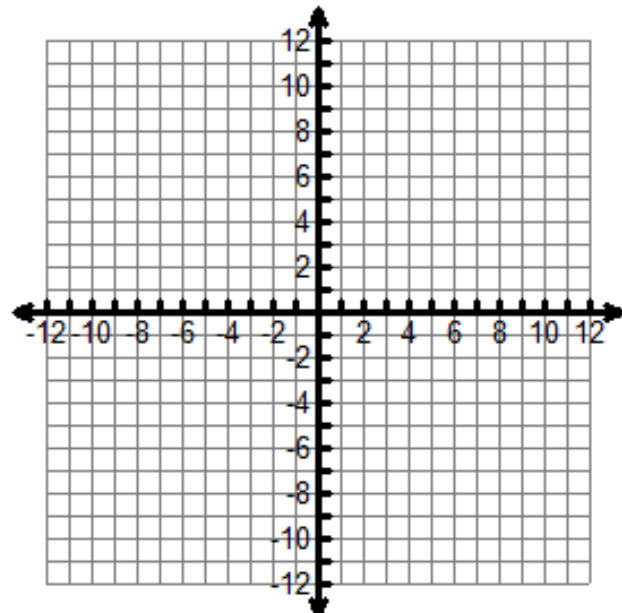
d) upward or downward?

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: \_\_\_\_\_

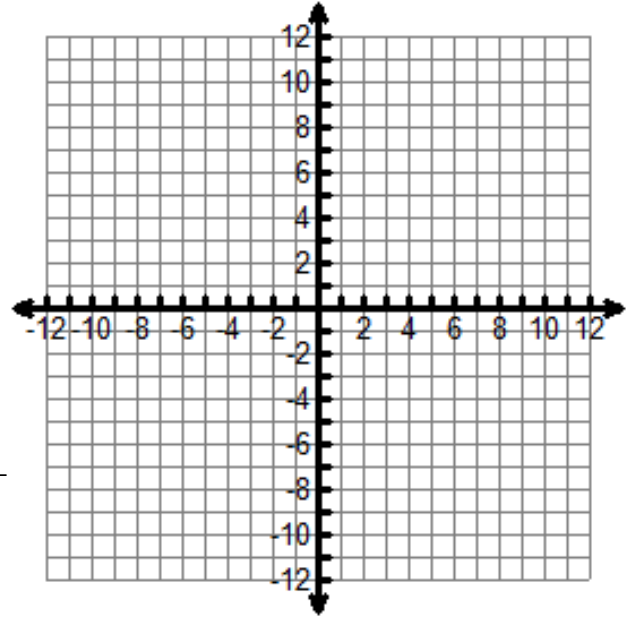
d) upward or downward?

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: \_\_\_\_\_

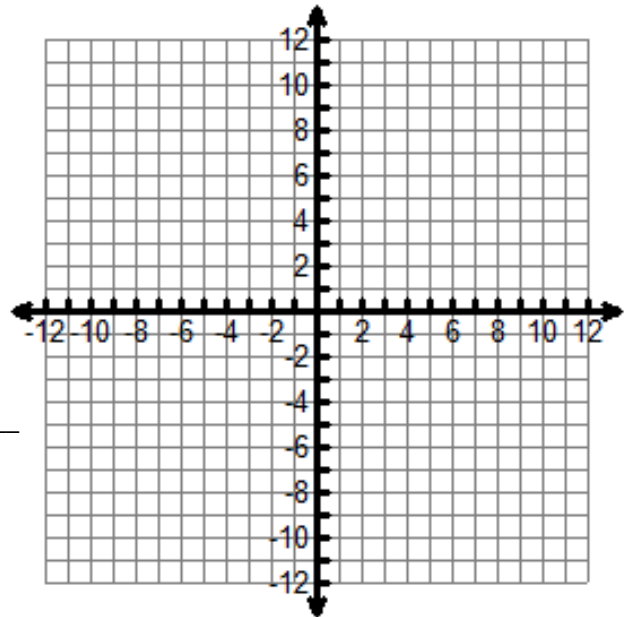
d) upward or downward?

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: \_\_\_\_\_

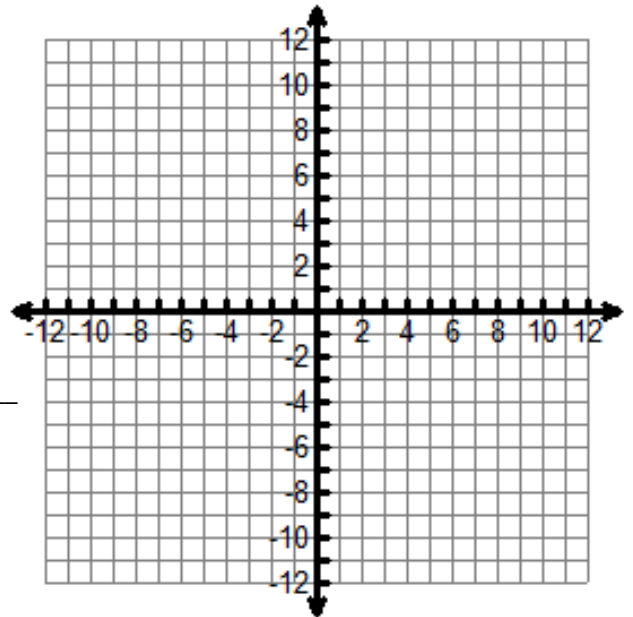
d) upward or downward?

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)  $a = \underline{\hspace{1cm}}$ ,  $b = \underline{\hspace{1cm}}$ , and  $c = \underline{\hspace{1cm}}$ .

c) axis of symmetry: \_\_\_\_\_

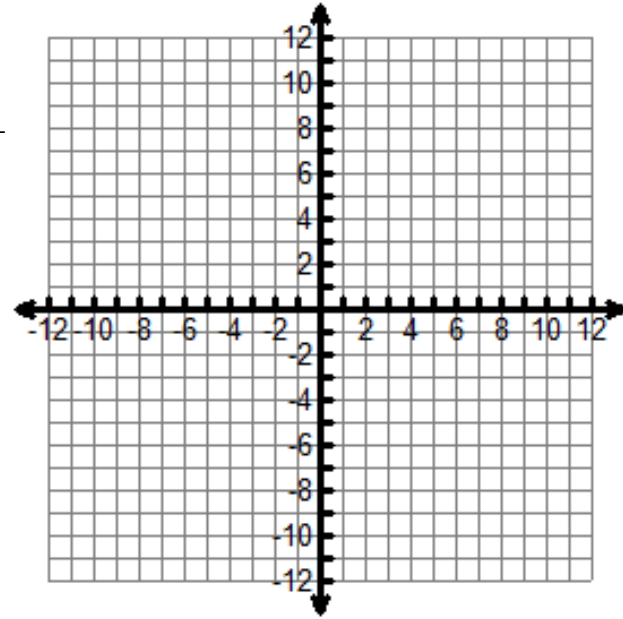
d) upward or downward?

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)  $a = \underline{\hspace{1cm}}$ ,  $b = \underline{\hspace{1cm}}$ , and  $c = \underline{\hspace{1cm}}$ .

c) axis of symmetry: \_\_\_\_\_

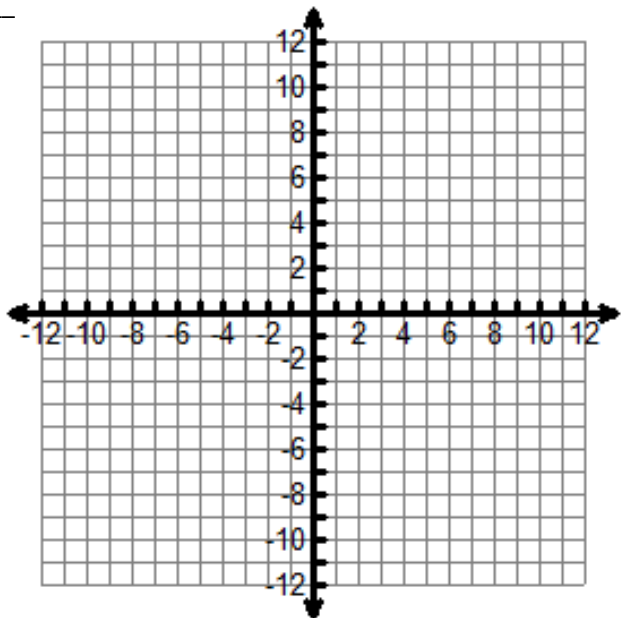
d) upward or downward?

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: \_\_\_\_\_

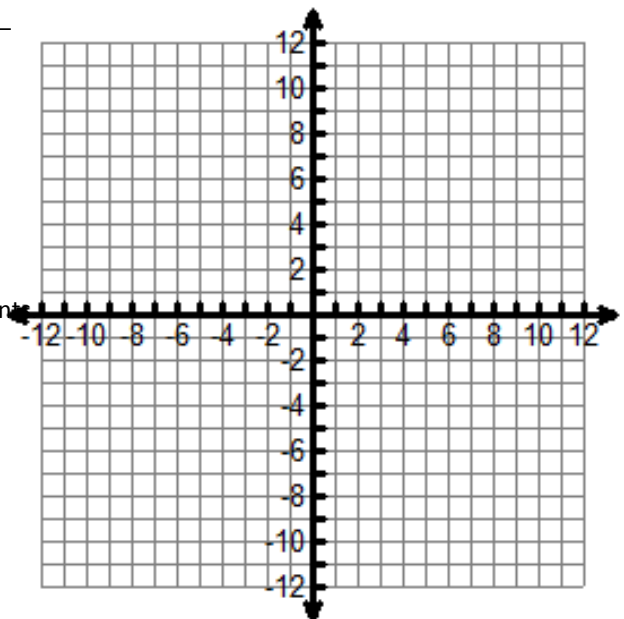
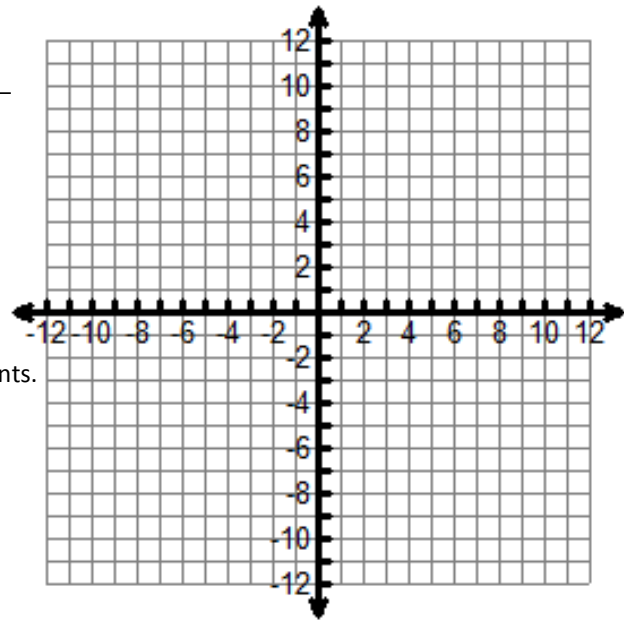
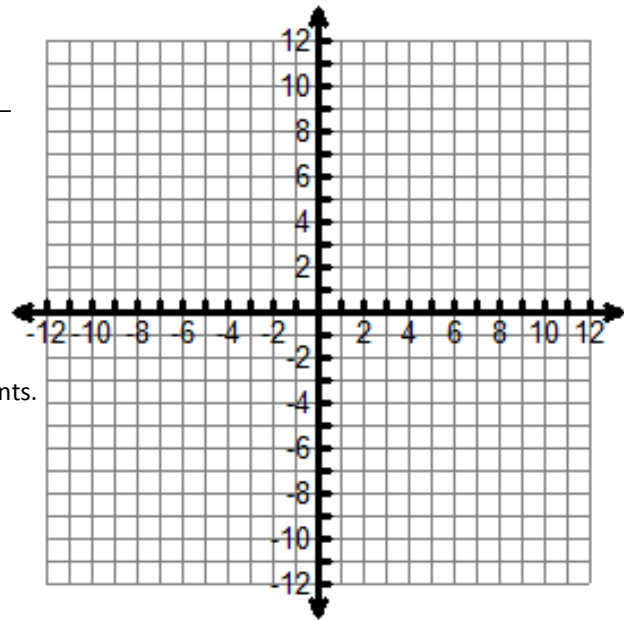
d) upward or downward?

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: \_\_\_\_\_

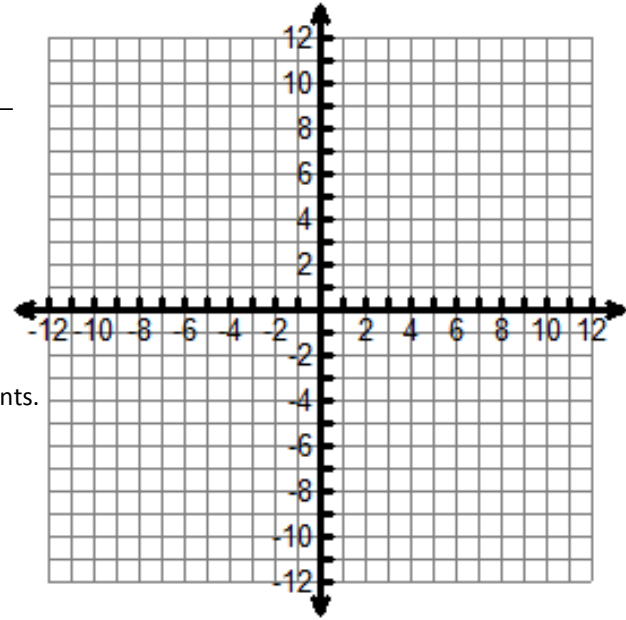
d) upward or downward?

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: \_\_\_\_\_

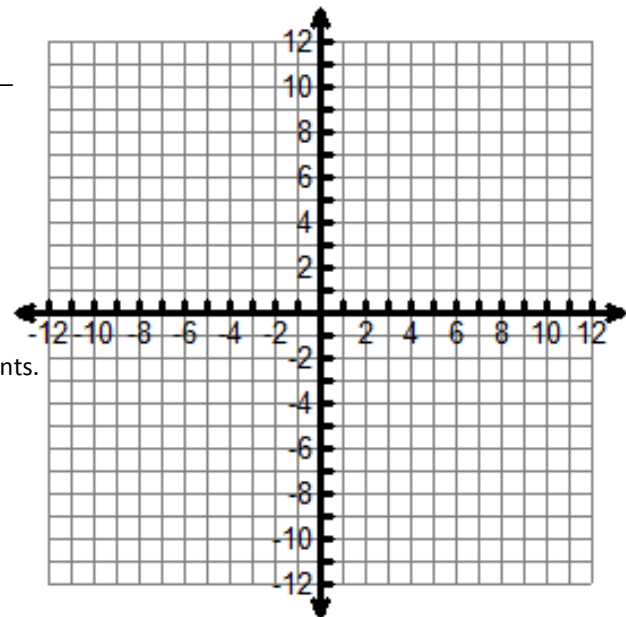
d) upward or downward?

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: \_\_\_\_\_

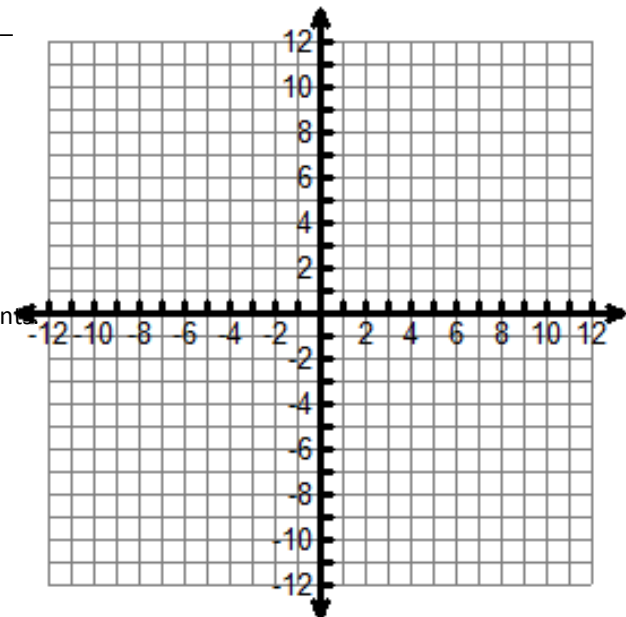
d) upward or downward?

e) vertex: \_\_\_\_\_

f) y-intercept: \_\_\_\_\_

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

x	f(x) =	f(x)



## Using Factoring to Solve Problems      Square Number and Consecutive Integers

For each problem, define the variable, write an equation, and solve.

### EXAMPLES

1) A number is added to its square, the result is 20. Find the number.

Variable: \_\_\_\_\_ Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

2) A negative number is 72 less than its square. Find the number.

Variable: \_\_\_\_\_ Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

3) The sum of the squares of two consecutive negative odd integers is 74. Find the numbers.

Variable: \_\_\_\_\_ Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

4) The sum of the squares of two consecutive positive even integers is 52. Find the numbers.

Variable: \_\_\_\_\_ Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

5) Find two consecutive negative integers whose product is 72.

Variable: \_\_\_\_\_ Equation: \_\_\_\_\_

Solution: \_\_\_\_\_



**ASSIGNMENT**

1) A number is added to its square, the result is 90. Find the number.

Variable: \_\_\_\_\_ Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

2) A negative number is 132 less than its square. Find the number.

Variable: \_\_\_\_\_ Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

3) The sum of the squares of two consecutive positive even integers is 340. Find the integers.

Variable: \_\_\_\_\_ Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

4) Find two consecutive positive odd integers whose product is 143.

Variable: \_\_\_\_\_ Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

5) The sum of the squares of two consecutive negative even integers is 100. Find the numbers.

Variable: \_\_\_\_\_ Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

6) A number is added to its square, the result is 42. Find the number.

Variable: \_\_\_\_\_ Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

7) The sum of the squares of two consecutive negative even integers is 452. Find the numbers.

Variable: \_\_\_\_\_ Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

8) A negative number is 90 less than its square. Find the number.

Variable: \_\_\_\_\_ Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

9) The sum of the squares of two consecutive negative odd integers is 202. Find the numbers.

Variable: \_\_\_\_\_ Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

10) The sum of the squares of two consecutive positive even integers is 580. Find the numbers.

Variable: \_\_\_\_\_ Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

**Review:**

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

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

a) Standard Form: \_\_\_\_\_

b)  $a =$  \_\_\_\_\_,  $b =$  \_\_\_\_\_, and  $c =$  \_\_\_\_\_.

c) axis of symmetry: \_\_\_\_\_

d) upward or downward?

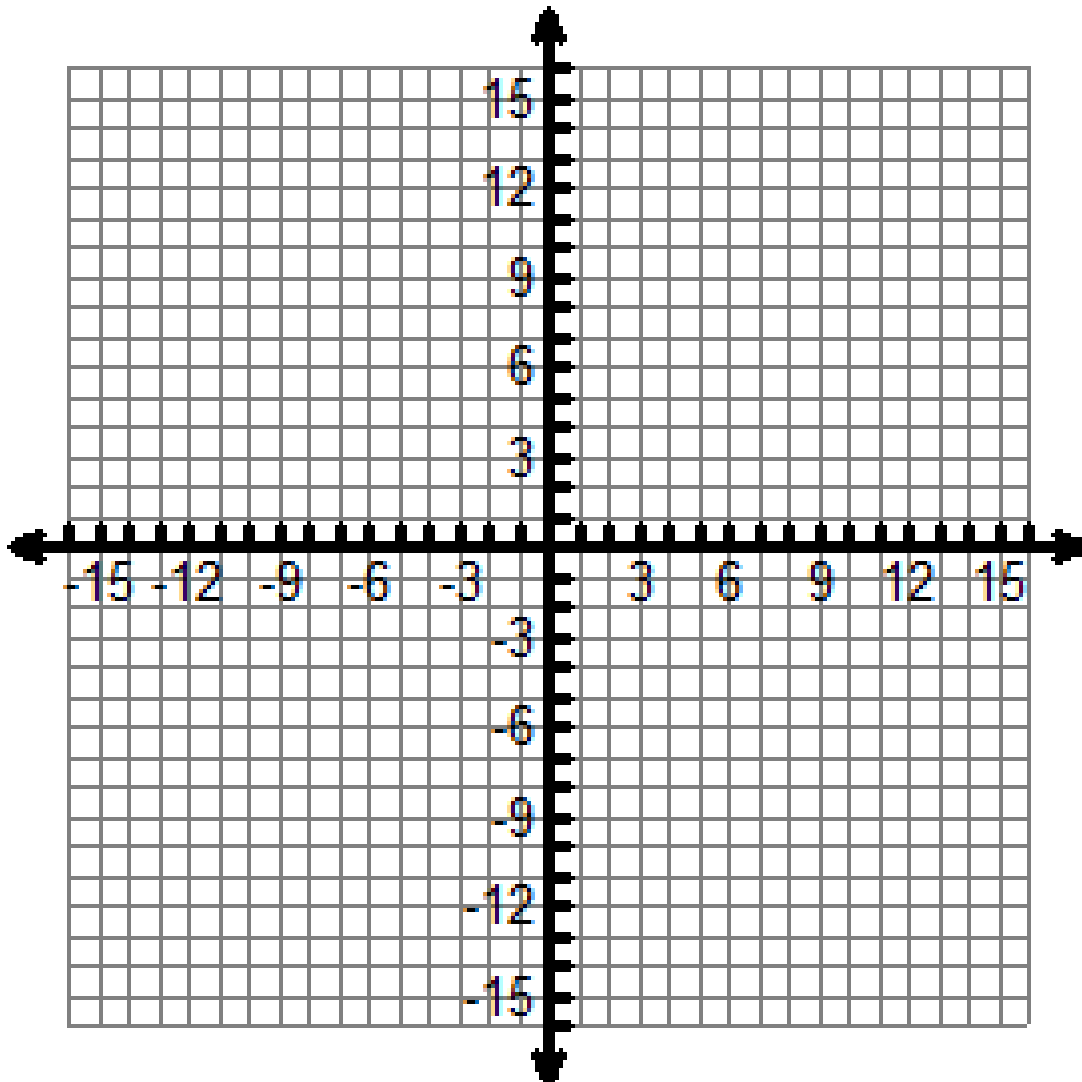
e) vertex: \_\_\_\_\_

f) y-intercept: \_\_\_\_\_

g) Factored form of related function: \_\_\_\_\_

h) x-intercepts: \_\_\_\_\_

g) Sketch the graph. Label the axis of symmetry, vertex and intercepts



Using Factoring to Solve ProblemsArea and Perimeter Problems

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

RECTANGLES

Area=

Perimeter=

EXAMPLES

1) Originally a rectangle was 5 ft by 12 ft. When both dimensions were decreased by the same amount, the **area** of the rectangle decreased by  $42 \text{ ft}^2$ . Find the dimensions of the new rectangle.

Variable: \_\_\_\_\_

Diagram: ↓

Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

2) The length of a rectangle is 5 cm greater than its width. Find the dimensions of the rectangle if its **area** is  $126 \text{ cm}^2$ .

Variable: \_\_\_\_\_

Diagram: ↓

Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

3) Find the dimensions of a rectangle whose perimeter is 52m and whose area is  $160\text{m}^2$ .

Variables: \_\_\_\_\_

Equations: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Solution: \_\_\_\_\_

4) A rectangular pool measures 4 yd by 5 yd. A concrete deck of uniform width is constructed around the pool. The deck and pool together cover an area of  $90 \text{ yd}^2$ . How wide is the deck?

Variable: \_\_\_\_\_

Diagram: ↓

Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

### ASSIGNMENT

1) Originally a rectangle was 8 m by 10 m. When both dimensions were increased by the same amount, the **area** of the rectangle increased by  $115 \text{ m}^2$ . Find the dimensions of the new rectangle.

Variable: \_\_\_\_\_

Diagram: ↓

Equation: \_\_\_\_\_

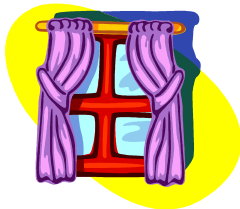
Solution: \_\_\_\_\_

2) Mr. Clemons replaced a square window with a rectangular one. The new window is 3 ft wider and 2 ft higher than the square one. It has an area of  $42 \text{ ft}^2$ . How long was a side of the original square window?

Variable: \_\_\_\_\_

Diagram: ↓

Equation: \_\_\_\_\_



Solution: \_\_\_\_\_

3) The dimensions of a rectangular garden were 7 m by 12 m. Each dimension was increased by the same amount. The garden then had an area of  $126 \text{ m}^2$ . Find the dimensions of the new garden.

Variable: \_\_\_\_\_

Diagram: ↓

Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

4) The length of a photograph is 3 cm less than twice the width. The area is  $54 \text{ cm}^2$ . Find the dimensions of the photograph.

Variable: \_\_\_\_\_

Diagram: ↓

Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

5) The length of a rectangle is 8 cm less than twice its width. Find the dimensions of the rectangle if the area is  $120 \text{ cm}^2$ .

Variable: \_\_\_\_\_

Diagram: ↓

Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

6) Originally the dimensions of a rectangle were 12 cm by 7 cm. When both dimensions were decreased by the same amount, the area of the rectangle decreased by  $34 \text{ cm}^2$ . Find the dimensions of the new rectangle.

Variable: \_\_\_\_\_

Diagram: ↓

Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

7) Find the dimensions of a rectangle whose perimeter is 68 m and whose area is  $280 \text{ m}^2$ .

Variables: \_\_\_\_\_

Equations: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Solution: \_\_\_\_\_

8) A rectangular garden measures 5 yd by 6 yd. A border of uniform width is constructed around the garden. The border and garden together cover an area of 72 yd<sup>2</sup>. How wide is the border?

Variable: \_\_\_\_\_

Diagram: ↓

Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

**Review**

9) The sum of the squares of two consecutive positive even integers is 724. Find the numbers.

Variable: \_\_\_\_\_

Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

10) 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: \_\_\_\_\_

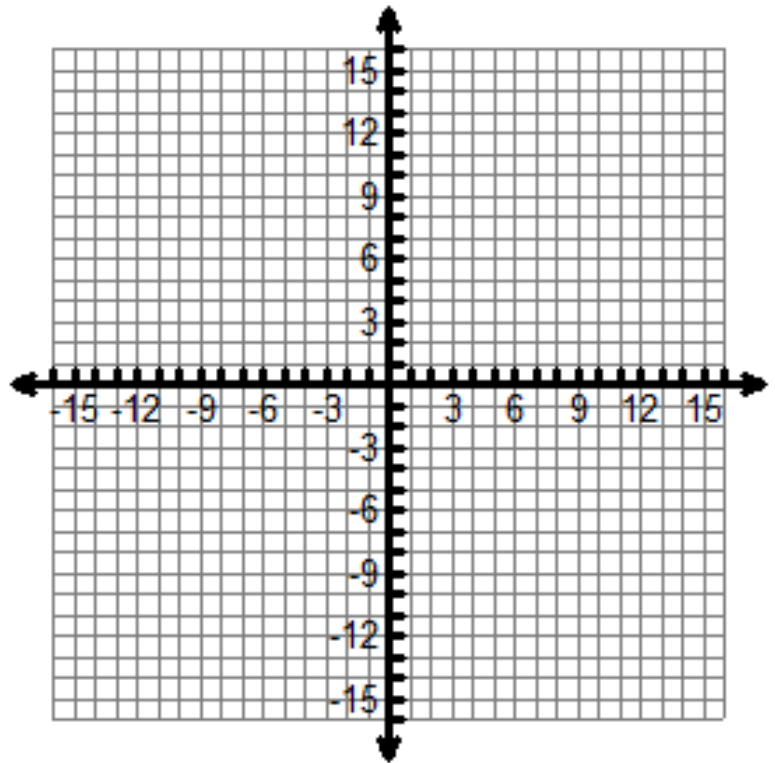
d) upward or downward?

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: \_\_\_\_\_

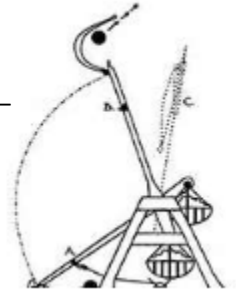


4) A trebuchet launches a projectile on a parabolic arc at a velocity of 147m/s. Determine when the projectile will first reach a height of 980 m, and how many seconds later will it again be 980m.

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: \_\_\_\_\_

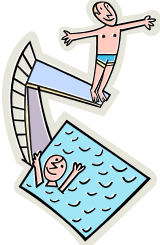
Solution: \_\_\_\_\_

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: \_\_\_\_\_



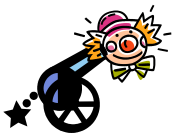
Solution: \_\_\_\_\_

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: \_\_\_\_\_

### Review

9) The sum of the squares of two consecutive positive odd integers is 290. Find the numbers.

Variable: \_\_\_\_\_

Equation: \_\_\_\_\_

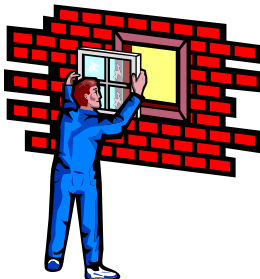
Solution: \_\_\_\_\_

10) Mr. Overbey replaced a square window with a rectangular one. The new window is 3 ft wider and 2 ft higher than the square one. It has an area of 30 ft<sup>2</sup>. How long was a side of the original square window?

Variable: \_\_\_\_\_

Diagram: ↓

Equation: \_\_\_\_\_

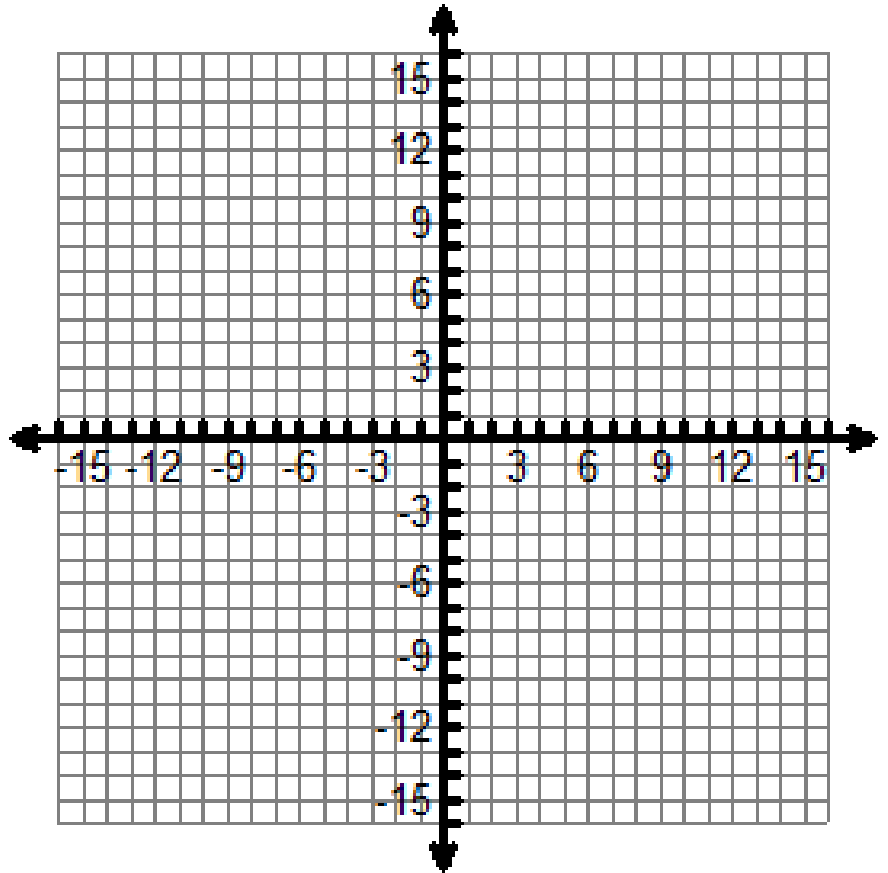


Solution: \_\_\_\_\_

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.

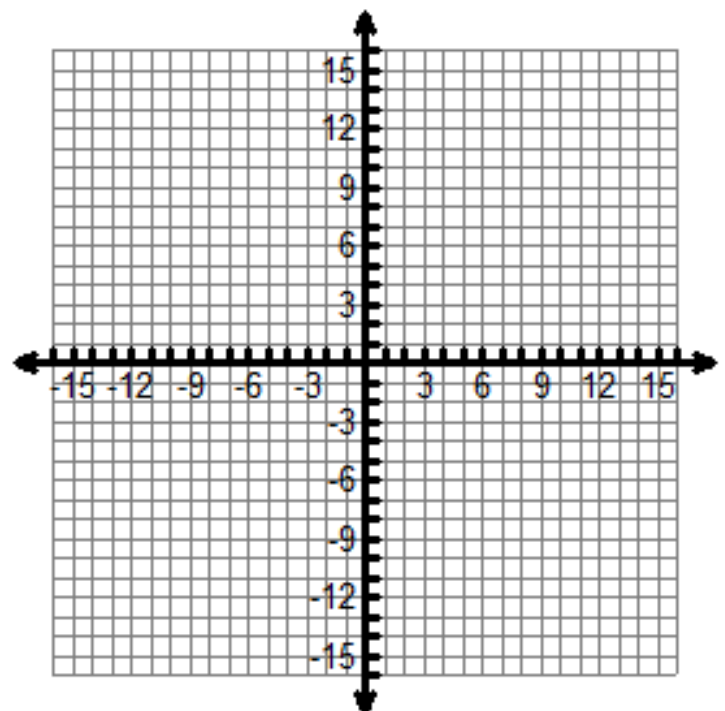


12) Graph the following quadratic function using the axis of symmetry, vertex and 2 other points.

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

- 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)

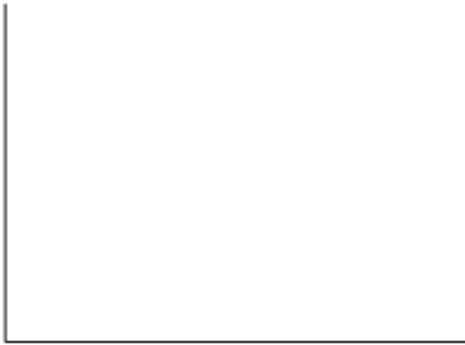
$v$  is the initial upward velocity (in ft/sec or m/sec)

$c$  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 Chris' 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 Chris to reach his maximum height?** Variable: \_\_\_\_\_ Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

b) **What was the highest point that Chris reached?** Variable: \_\_\_\_\_ Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

c) **Chris 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: \_\_\_\_\_

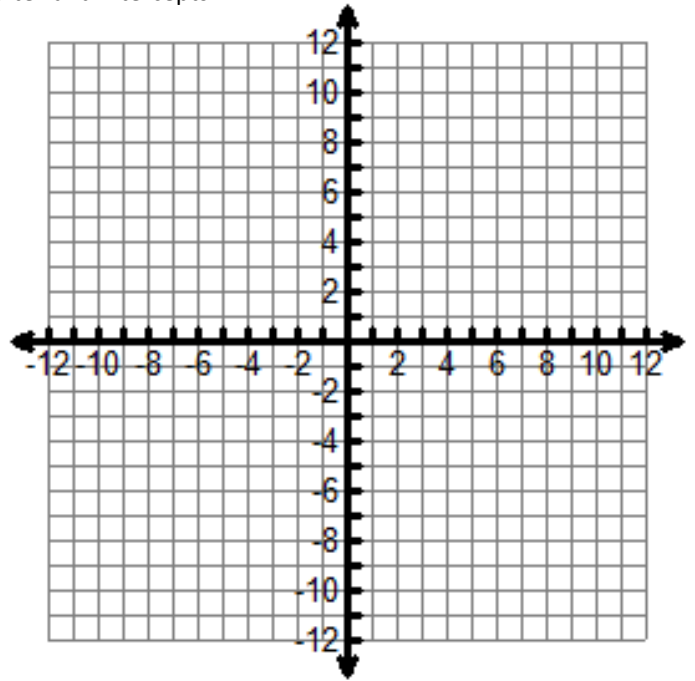
Solution: \_\_\_\_\_

**Review:**

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

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

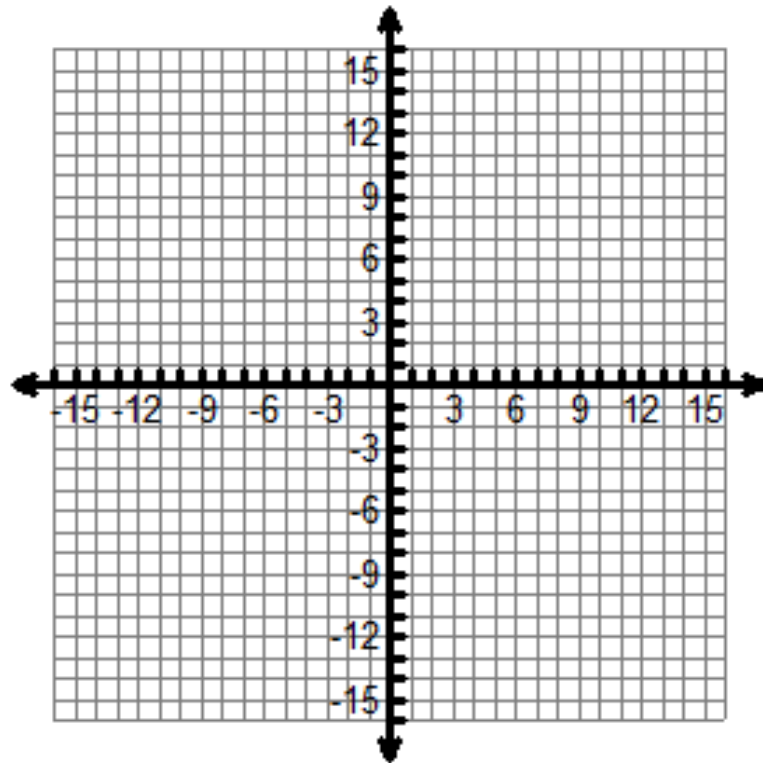
- a) Standard Form: \_\_\_\_\_
- b)  $a =$  \_\_\_\_\_,  $b =$  \_\_\_\_\_, and  $c =$  \_\_\_\_\_.
- c) axis of symmetry: \_\_\_\_\_
- d) upward or downward?
- e) vertex: \_\_\_\_\_
- f) y-intercept: \_\_\_\_\_
- g) Factored form of related function: \_\_\_\_\_
- h) x-intercepts: \_\_\_\_\_
- g) Sketch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



6) The sum of the squares of two consecutive negative odd integers is 290. Find the numbers.

Variable: \_\_\_\_\_

Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

7) Find two consecutive positive integers whose product is 462.

Variable: \_\_\_\_\_

Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

8) The length of a rectangle is 4 cm less twice its width. Find the dimensions of the rectangle if the area is  $390 \text{ cm}^2$ .

Variable: \_\_\_\_\_

Diagram: ↓

Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

9) Originally the dimensions of a rectangle were 16 cm by 5 cm. When both dimensions were increased by the same amount, the area of the rectangle increased by  $162 \text{ cm}^2$ . Find the dimensions of the new rectangle.

Variable: \_\_\_\_\_

Diagram: ↓

Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

10) A rectangular garden measures 8 yd by 10 yd. A border of uniform width is constructed around the garden. The border and garden together cover an area of  $168 \text{ yd}^2$ . How wide is the border?

Variable: \_\_\_\_\_

Diagram: ↓

Equation: \_\_\_\_\_

Solution: \_\_\_\_\_

11) Find the dimensions of a rectangle whose perimeter is 40 m and whose area is 84 m<sup>2</sup>.

Variables: \_\_\_\_\_ Equations: \_\_\_\_\_  
 \_\_\_\_\_

Solution: \_\_\_\_\_

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: \_\_\_\_\_