

Math 2 Unit 11 Worksheet 1
Changing from Standard to Vertex Form

Name: _____
Date: _____ **Per:** _____

[1-9] Find the value of c in the expression that completes the square, where $c =$ _____. Then write in factored form.

1. $x^2 + 12x +$ ____

2. $x^2 + 8x +$ ____

3. $x^2 - 6x +$ ____

4. $x^2 + 2x +$ ____

5. $x^2 - 14x +$ ____

6. $x^2 + 4x +$ ____

5. $x^2 + 6x +$ ____

8. $x^2 + 5x +$ ____

9. $x^2 + 7x +$ ____

[10-21] a) Write the following functions in vertex form by completing the square.

b) Find the vertex.

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

11. $y = x^2 - 10x - 26$

a) Vertex Form: _____

a) Vertex Form: _____

b) Vertex: (____, ____)

b) Vertex: (____, ____)

12. $y = x^2 - 18x + 57$

13. $y = x^2 + 4x + 12$

a) Vertex Form: _____

a) Vertex Form: _____

b) Vertex: (____, ____)

b) Vertex: (____, ____)

14. $y = x^2 + 16x + 20$

a) Vertex Form: _____

b) Vertex: (____, ____)

16. $y = 2x^2 + 8x - 7$

a) Vertex Form: _____

b) Vertex: (____, ____)

18. $y = x^2 + 14x + 32$

a) Vertex Form: _____

b) Vertex: (____, ____)

20. $y = x^2 + 12x + 24$

a) Vertex Form: _____

b) Vertex: (____, ____)

15. $y = x^2 - 12x - 8$

a) Vertex Form: _____

b) Vertex: (____, ____)

17. $y = 2x^2 + 20x + 31$

a) Vertex Form: _____

b) Vertex: (____, ____)

19. $y = 3x^2 - 18x + 16$

a) Vertex Form: _____

b) Vertex: (____, ____)

21. $y = x^2 - 2x - 4$

a) Vertex Form: _____

b) Vertex: (____, ____)

Math 2 Unit 11 Worksheet 2
Solving by Completing the Square

Name: _____
Date: _____ **Per:** _____

[1-12] Solve for x by completing the square and square rooting. If no real value of x makes the equation true, write none.

1. $x^2 + 8x - 12 = 0$

2. $x^2 + 12x + 14 = 0$

3. $x^2 - 18x = -57$

4. $x^2 + 6x + 12 = 0$

5. $x^2 - 10x = 26$

6. $x^2 - 20x - 46 = -2$

5. $x^2 + 14x + 47 = 5$

8. $x^2 + 8x + 24 = 0$

9. $x^2 - 16x + 20 = 12$

10. $x^2 + 18x + 27 = -5$

11. $x^2 - 8x + 20 = 0$

12. $x^2 + 2x - 20 = -3$

[13-17] Write the following equations in vertex form and find the vertex, x -intercept(s), y -intercept, and graph for each quadratic function.

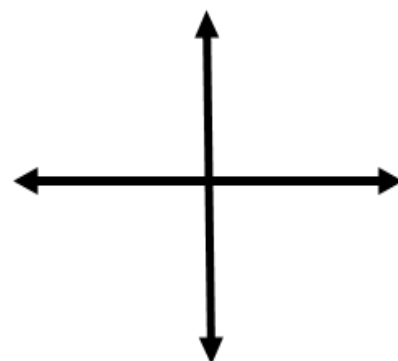
13. $y = x^2 + 2x - 15$

Vertex Form: _____

Vertex: _____

x -intercept(s): _____

y -intercept: _____



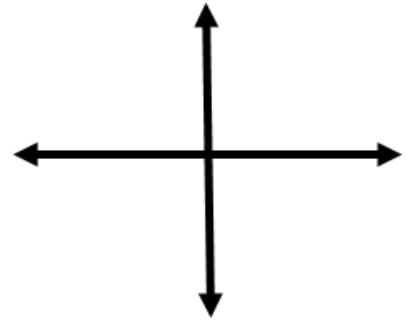
14. $y = x^2 - 12x + 32$

Vertex Form: _____

Vertex: _____

x -intercept(s): _____

y -intercept: _____



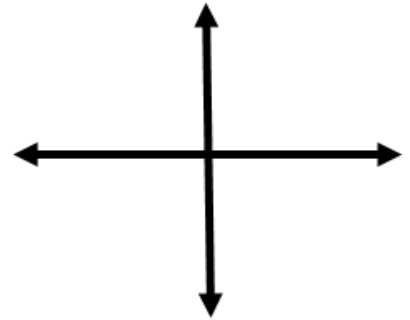
15. $y = x^2 - 2x + 5$

Vertex Form: _____

Vertex: _____

x -intercept(s): _____

y -intercept: _____



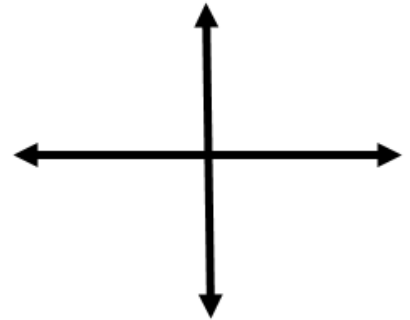
16. $y = x^2 + 6x + 7$

Vertex Form: _____

Vertex: _____

x -intercept(s): _____

y -intercept: _____



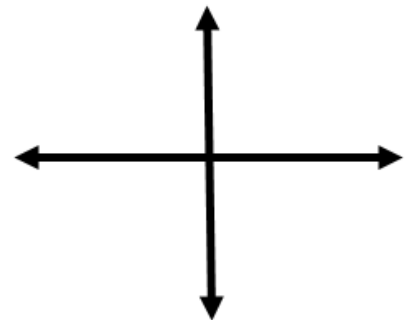
17. $y = x^2 + 4x + 7$

Vertex Form: _____

Vertex: _____

x -intercept(s): _____

y -intercept: _____



18. When a parabola does not cross the x -axis, what happens algebraically when you try to solve for the x -intercept(s)?

Math 2 Unit 11 Worksheet 3A
Imaginary and Complex Numbers

Name: _____
Date: _____ **Per:** _____

[1-9] Rewrite using the imaginary number i .

1. $\sqrt{-36}$

2. $\sqrt{-4}$

3. $\sqrt{-1}$

4. $\sqrt{-16}$

5. $\sqrt{-12}$

6. $\sqrt{-24}$

7. $\sqrt{-64}$

8. $\sqrt{-7}$

9. $\sqrt{-27}$

[10-15] Find the sum or difference.

10. $(7 + 4i) + (3 - 5i)$

11. $(4 - 2i) - (8 - 7i)$

12. $(8 + 3i) + 2(12 - 8i)$

13. $(3 + i) + (12 - 13i)$

14. $(7 + 5i) - 3(18 + 5i)$

15. $(24 - 13i) - 2(17 + 8i)$

[16-25] Multiply.

16. $(4i)(7i)$

17. $(12i)(4i)$

18. $(2i)(5i)(8i)$

19. $(2i)(5i)(8i)(10i)$

20. $(1 + 5i)(4 - 2i)$

	1	+	5i
4			
-2i			

21. $(2 - 3i)(2 + 3i)$

	2	+	3i
2			
-3i			

22. $(4 + 8i)^2$

23. $(2 - 9i)(3 + 4i)$

24. $(3 - 7i)(3 + 7i)$

25. $(6 - 8i)(4 - 7i)$

26. Simplify the following to include at most one i .

$i^1 = \underline{\hspace{2cm}}$

$i^2 = \underline{\hspace{2cm}}$

$i^3 = \underline{\hspace{2cm}}$

$i^4 = \underline{\hspace{2cm}}$

$i^5 = \underline{\hspace{2cm}}$

$i^6 = \underline{\hspace{2cm}}$

$i^7 = \underline{\hspace{2cm}}$

$i^8 = \underline{\hspace{2cm}}$

$i^9 = \underline{\hspace{2cm}}$

$i^{10} = \underline{\hspace{2cm}}$

27. What patterns do you notice in your answers on number 26?

28. Based on the patterns you noticed, simplify the following to include at most one i .

$i^{12} = \underline{\hspace{2cm}}$

$i^{23} = \underline{\hspace{2cm}}$

$i^{28} = \underline{\hspace{2cm}}$

$i^{46} = \underline{\hspace{2cm}}$

Math 2 Unit 11 Worksheet 3B
Using Complex Numbers

Name: _____
Date: _____ **Per:** _____

[1-6] Solve the following equations for x . Express answers as complex numbers in simplified radical form.

1. $x^2 + 6x = -13$

2. $x^2 + 6x + 15 = 0$

3. $x^2 - 2x + 10 = 0$

4. $x^2 + 8x + 24 = 0$

5. $x^2 - 8x = -28$

6. $x^2 - 10x + 7 = 0$

7. $x^2 - 20x + 20 = 0$

8. $x^2 + 14x = -73$

Review

[9-18] Simplify.

9. $(2 + 5i) + (6 - 7i)$

10. $(7 + 3i) - (5 - 8i)$

11. $(-3i)(12i)$

12. $(5i)^2$

13. $(7i)(2i)(5i)$

14. $(3i)(4i)(5i)(6i)$

15. $(2i)^5$

16. $(6 + 4i)(5 - 2i)$

17. $(1 + 3i)(1 - 3i)$

18. $(2 + 7i)^2$

[19-21] Match the equation to what characteristics it reveals without changing the form of the equation.

19. _____ Reveals the maximum value of $m(x)$

Ⓐ $m(x) = -4(x + 8)^2 + 7$

20. _____ Reveals the zeros (x -intercepts) of $m(x)$

Ⓑ $m(x) = -4x^2 + 20x + 15$

21. _____ Reveals the y -intercept when $x = 0$

Ⓒ $m(x) = -4(x + 7)(x - 5)$

Math 2 Unit 11 Worksheet 4
Quadratic Formula & Mid-Unit Review

Name: _____
Date: _____ **Per:** _____

[1-10] Solve using the Quadratic Formula. Leave answers in simplest radical form.

1. $2n^2 - 7n - 3 = 0$

2. $3m^2 = 4 - 6m$

3. $n^2 + 8n - 16 = 0$

4. $2x^2 + 3x - 7 = 0$

5. $x^2 + 3x + 5 = 0$

6. $2m^2 - 3m + 1 = 2m$

7. $p^2 - p + 2 = 2p - 5$

8. $x^2 - 9x + 20 = 14$

9. $2k^2 + 8k - 15 = -18$

10. $2x^2 + 4x + 5 = 0$

Mid-Unit Review

[11-12] Solve by completing the square. Leave answers in simplest radical form.

11. $x^2 - 8x + 12 = 7$

12. $x^2 + 10x = -5$

[13-14] a) Write the following functions in vertex form by completing the square.

b) Find the vertex.

13. $y = x^2 + 6x + 17$

14. $y = x^2 - 14x + 9$

a) Vertex Form: _____

a) Vertex Form: _____

b) Vertex: (____, ____)

b) Vertex: (____, ____)

[15-20] Simplify the following to include at most one i .

15. $(7 + 3i) + (5 - 9i)$

16. $(2 + 8i) - (12 - 3i)$

17. $(3i)(8i)$

18. $(6 + 4i)(2 - 3i)$

19. $(2i)(-5i)(3i)(7i)(i^3)$

20. $(3 - 4i) - 7(5 + i)$

Math 2 Unit 11 Worksheet 5
Quadratic Formula and Applications

Name: _____
Date: _____ **Per:** _____

[1-4] Solve using the quadratic formula. Simplify answers in decimal form to the nearest hundredth.

1. $3x^2 - 10x - 8 = 0$

2. $3p^2 - 5p + 8 = 6$

3. $x^2 - 2x - 4 = 2x - 1$

4. $x^2 - 10x + 13 = 0$

[5-8] Find the axis of symmetry and the vertex for each parabola.

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

Vertex: _____

AOS: _____

6. $y = -2x^2 + 12x - 13$

Vertex: _____

AOS: _____

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

Vertex: _____

AOS: _____

8. $g(x) = 3x^2 - 12x + 5$

Vertex: _____

AOS: _____

[9-13] Solve the following word problems. Include the correct units in your answers.

9. The profit from a t-shirt sale fundraiser depends on the t-shirt price and can be modeled by $P = -15t^2 + 600t + 50$, where t is the price per t-shirt and P is the profit, both measured in dollars.

a) What t-shirt price yields the maximum profit?

b) What is the maximum profit?

10. A ball is thrown vertically upward with an initial velocity of 48 feet per second. If the ball started its flight at a height of 8 feet, then its height h at time t can be determined by the function $h = -16t^2 + 64t + 8$ where h is measured in feet above ground level and t is the number of seconds of flight.

a) What is the height of the ball at 1 second?

e) Sketch the graph of the function below.

Label points that correspond to answers from parts a, b, c, and d.

b) What is the height of the ball at 3 seconds?

c) Determine the maximum height the ball attains.



d) When does the ball hit the ground? Round answer to the nearest tenth of a second.

f) Label the y -intercept on the graph above.

What would the y -intercept represent in this situation?

11. A projectile is launched vertically from the top of a tower at a velocity of 80 feet per second. The tower is 200 feet high. The height of the projectile above the ground ' t ' seconds after launch is given by the function $h(t) = -16t^2 + 80t + 200$.

a) What is the maximum height achieved by the projectile?

b) How long after firing does it reach its maximum height?

12. A ball is thrown vertically into the air with an initial velocity of 64 feet per second. The function $y = -16t^2 + 64t$ gives its height above the ground after ' t ' seconds.

a) What is its height after 1.5 seconds?

c) When will the ball hit the ground?

b) What is its maximum height?

Math 2 Unit 11 Worksheet 6
Graphing and Solving with Different Methods

Name: _____
Date: _____ **Per:** _____

[1-3] Solve one part by factoring, one by completing the square, and one by quadratic formula for each problem.

1. a) $x^2 + 4x - 9 = 0$

b) $3x^2 - 7x - 5 = 0$

c) $x^2 - 2x - 15 = 0$

2. a) $2x^2 - 19x + 9 = 0$

b) $x^2 - 12x - 30 = 0$

c) $x^2 - 19x + 84 = 0$

3. a) $3x^2 - 11x - 7 = 0$

b) $x^2 - 2x - 12 = 0$

c) $3x^2 + 6x - 9 = 0$

4. What strategy did you use to decide which problem you should do by each method?

5. Solve the following problem three times, one with each method: $2x^2 - 12x - 14 = 0$

a) Solve by: factoring

b) Solve by: quadratic formula

c) Solve by: completing the square

d) Which method did you prefer for this problem? Why?

<p>Vertex Form</p> $y = a(x - h)^2 + k$

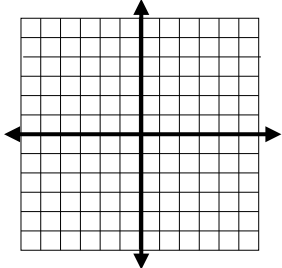
<p>Standard Form</p> $y = ax^2 + bx + c$
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<p>Intercept Form</p> $y = a(x - p)(x - q)$

[6-7] Graph the following parabolas written in vertex form and determine the key features.

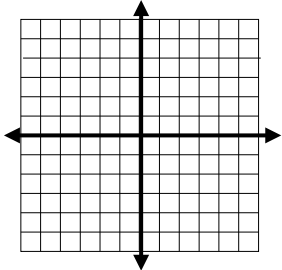
6. $y = -2(x - 3)^2 + 2$

Vertex: _____
 Axis of Symmetry: _____
 x-intercept(s): _____
 y-intercept: _____



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

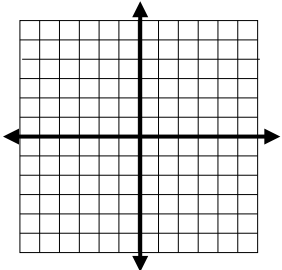
Vertex: _____
 Axis of Symmetry: _____
 x-intercept(s): _____
 y-intercept: _____



[8-9] Graph the following parabolas written in standard form and determine the key features.

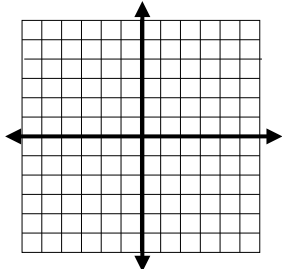
8. $y = x^2 - 2x - 3$

Vertex: _____
 Axis of Symmetry: _____
 x-intercept(s): _____
 y-intercept: _____



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

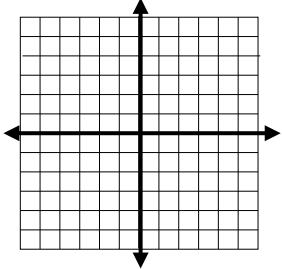
Vertex: _____
 Axis of Symmetry: _____
 x-intercept(s): _____
 y-intercept: _____



[10-11] Graph the following parabolas written in intercept form and determine the key features.

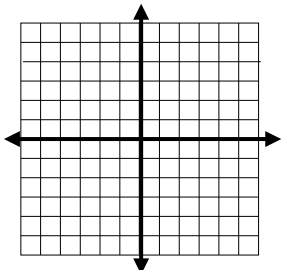
10. $y = -\frac{1}{2}(x + 2)(x - 4)$

Vertex: _____
 Axis of Symmetry: _____
 x-intercept(s): _____
 y-intercept: _____



11. $y = \frac{1}{4}(x + 3)(x - 3)$

Vertex: _____
 Axis of Symmetry: _____
 x-intercept(s): _____
 y-intercept: _____



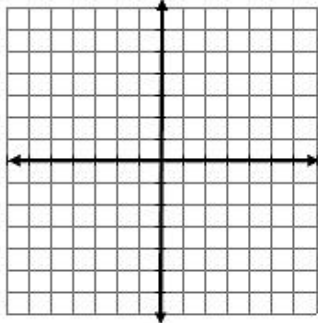
Math 2 Unit 11 Worksheet 7
Systems of Equations

Name: _____
Date: _____ **Per:** _____

[1-4] Find all solutions to $f(x) = g(x)$. a) Solve by graphing, and b) solve algebraically using substitution.

1. $f(x) = 2x - 5$ and $g(x) = -\frac{1}{3}x + 2$

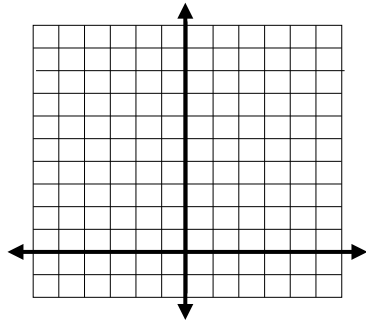
a) $f(x) = g(x)$ at (____, ____)



b) Solve the system algebraically to find when $f(x) = g(x)$.

2. $f(x) = 2x^2 + 1$ and $g(x) = -2x + 5$

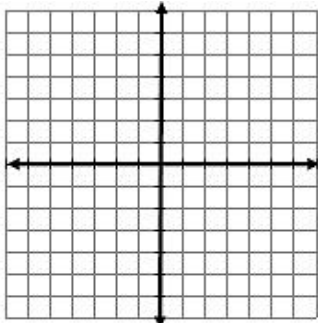
a) $f(x) = g(x)$ at (____, ____) and (____, ____)



b) Solve the system algebraically to find when $f(x) = g(x)$.

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

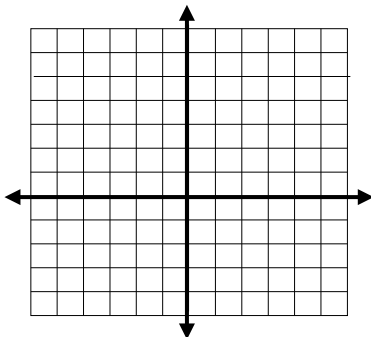
a) $f(x) = g(x)$ at (____, ____) and (____, ____)



b) Solve the system algebraically to find when $f(x) = g(x)$.

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

a) $f(x) = g(x)$ at (____, ____) and (____, ____)



b) Solve the system algebraically to find when $f(x) = g(x)$.

[5-12] Find all values of x for which $f(x) = g(x)$. Solve algebraically.

5. $f(x) = -x - 7$

$$g(x) = x^2 - 4x - 5$$

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

$$g(x) = 7x + 2$$

7. $f(x) = -14x + 94$

$$g(x) = x^2 - 13x + 52$$

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

$$g(x) = -x^2 + 4x + 1$$

9. $f(x) = 3x - 5$

$$g(x) = x^2 - 5$$

10. $f(x) = 5x - 1$

$$g(x) = x^2 - 1$$

11. $f(x) = -3$

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

12. $f(x) = 2x - 4$

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

13. Based on your answer for problem 12, what do you know about the graphs of these two functions?

Math 2 Unit 11
Review Worksheet

Name: _____
Date: _____ Per: _____

[1-6] What is the value of c that makes each trinomial a perfect square?

1. $x^2 + 16x + c$

2. $x^2 - 8x + c$

3. $x^2 + 6x + c$

4. $x^2 - 14x + c$

5. $x^2 + 5x + c$

6. $x^2 - 24x + c$

[7-10] Solve by completing the square. Express answers in simplified radical form and complex solutions in terms of i .

7. $a^2 + 12a + 32 = 0$

8. $x^2 - 14x + 44 = 0$

9. $2n^2 - 12n + 24 = 0$

10. $4p^2 - 8p - 60 = 0$

[11-12] Solve by the quadratic formula.

11. a) Solve $x^2 - 9x + 21 = 0$ using the quadratic formula by completing the boxes from the number choices.

-21	-9	-4	-2	-1	+1	+2	+4	+9	+21
-----	----	----	----	----	----	----	----	----	-----

$$x = \frac{- (\boxed{}) \pm \sqrt{(\boxed{})^2 - (\boxed{})(\boxed{})(\boxed{})}}{(\boxed{})(\boxed{})}$$

11. b) Solve for x in 11a, write answer in simplified radical form.

11b) _____

12. a) Solve $n^2 - 20n + 91 = 0$ using the quadratic formula by completing the boxes from the number choices.

-91	-20	-4	-2	-1	+1	+2	+4	+20	+91
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$$x = \frac{- (\boxed{}) \pm \sqrt{(\boxed{})^2 - (\boxed{})(\boxed{})(\boxed{})}}{(\boxed{})(\boxed{})}$$

12. b) Solve for x in 12a, write answer in simplified radical form.

12b) _____

[13-14] Solve by the quadratic formula.

13. $2x^2 + 10x - 3 = 0$

14. $x^2 = 6x - 14$

[15-18] Solve each equation for x using any method. Express answers in simplified radical form and complex solutions in terms of i .

15. $x^2 - 1 = 3x$

16. $x^2 - 121 = 0$

17. $b^2 + 8b - 39 = -6$

18. $3a^2 - 15a = 0$

[19-26] Simplify.

19. $(7 + 3i) + 3(5 - 9i)$

20. $4(2 + 8i) - 2(12 - 3i)$

21. $(3i)(9i)$

22. $(-5i)(4i)(7i)(2i)(3i^2)$

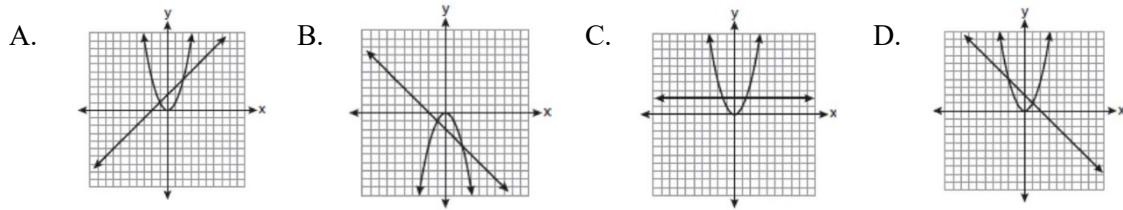
23. $(6 + 4i)(2 - 3i)$

24. $(2 - 3i)(5 - i)$

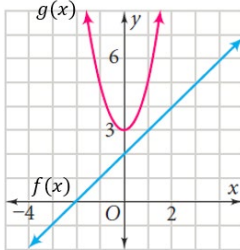
25. $(7 + 2i)^2$

26. $(7 + 2i)(7 - 2i)$

27. Select the graph with the correct solutions for $f(x) = g(x)$ when $f(x) = x^2$ and $g(x) = -x + 2$.

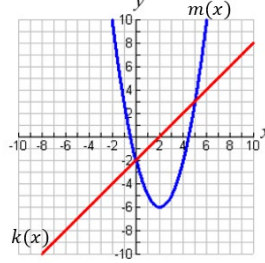


28. Select the correct solution(s) for $f(x) = g(x)$.



- A. $x = -2$ only
- B. $x = 2$ only
- C. $x = -2$ and 2
- D. There are no solutions to $f(x) = g(x)$

29. Select the correct solution(s) for $m(x) = k(x)$.



- A. $x = 0$ only
- B. $x = 5$ only
- C. $x = 0$ and 5
- D. There are no solutions to $m(x) = k(x)$

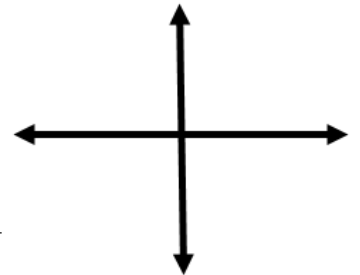
30. Graph the following parabola written in standard form and determine the key features.

$$y = 2x^2 - 12x + 10$$

Vertex: _____

Axis of Symmetry: _____

x-intercept(s): _____



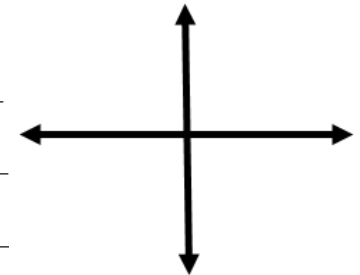
31. Graph the following parabola written in standard form and determine the key features.

$$y = 3x^2 + 6x - 9$$

Vertex: _____

Axis of Symmetry: _____

x-intercept(s): _____



[32-33] Given a quadratic function in standard form $f(x) = ax^2 + bx + c$, determine the equivalent equation in vertex form $f(x) = a(x - h)^2 + k$, where a , h , and k are constants.

32. $f(x) = x^2 - 12x + 10$

33. $f(x) = 8x^2 + 16x - 22$

34. Consider the equation $(x - 1)^2 + k = 0$. Create a value for k that gives:
- no real solutions
 - two real solutions
35. Consider the equation $-2(x + 4)^2 + k = 0$. Create a value for k that gives:
- no real solutions
 - two real solutions
36. A firework is launched from a platform that is 10 feet high. It is set to explode as it reaches maximum height. The height of the firework, h , can be modeled by the function $h = -16t^2 + 160t + 10$, where t is the number of seconds after launch.
- How long does it take to reach the maximum height?
 - What is the maximum height?
37. Aaron Judge hit his longest homerun on June 12th, 2017 with a length of 496 feet. Bryce Harper's longest homerun was hit the following month on July 22nd, 2017 with a length of 467 feet. The functions below model these hits, where the height, h , of the ball after t seconds is given by:
- Judge: $h = -16t^2 + 160t + 4$
Harper: $h = -16t^2 + 128t + 4$
- Whose ball reached a greater vertical height? Show work to support your answer.
 - If the ball was able to travel until it hit the ground, how long would Judge's ball be in the air?
 - If the ball was able to travel until it hit the ground, how long would Harper's ball be in the air?