Mini-Lecture 8.1

Solving Quadratic Equations by Completing the Square

Learning Objectives:

1. Use the square root property to solve quadratic equations.
2. Solve quadratic equations by completing the square.
3. Use quadratic equations to solve problems.
4. Key vocabulary: *quadratic equation, perfect square trinomial.*

Examples:

1. Use the square root property to solve each equation.

   a) $x^2 = 9$ b) $x^2 = 20$ c) $2x^2 + 72 = 0$ d) $4x^2 = 16$

   e) $(x-5)^2 = 25$ f) $(x+3)^2 = 11$ g) $(4x+1)^2 = 36$ h) $(5x-3)^2 = 48$

2. Solve each equation by completing the square.

   a) $x^2 + 4x = -3$ b) $x^2 - 2x = 35$ c) $x^2 + 20x + 30 = 0$

   d) $2x^2 - 5x = 3$ e) $2x^2 + 11x = -12$ f) $2x^2 + 5x - 3 = 0$

   g) $6x^2 + 10x + 2 = 0$ h) $4x^2 - 16x + 80 = 0$ i) $x^2 + x = -1$

3. The distance, $s(t)$, in feet traveled by a freely falling object is given by the function $s(t) = 16t^2$, where *t* is time in seconds. How long would it take for an object to fall to the ground from 576 feet high?

Teaching Notes:

- Many students forget the +/- when using the square root property.
- Most students are confused by completing the square at first and need to see many examples.
- Refer students to the ***Solving a Quadratic Equation in x by Completing the Square*** chart in text.

Answers: 1a) {3,-3}, b) $\{2\sqrt{5}, -2\sqrt{5}\}$, *c){6i,-6i}, d) {2,-2}, e) {10,0}, f)* $\{-3+\sqrt{11}, -3-\sqrt{11}\}$, *g)* $\left\{\frac{5}{4}, -\frac{7}{4}\right\}$, *h)* $\left\{\frac{3+4\sqrt{3}}{5}, \frac{3-4\sqrt{3}}{5}\right\}$; *2a) {-3,-1}, b) {7,-5}, c)* $\{-10+\sqrt{70}, -10-\sqrt{70}\}$, *d)* $\left\{3, -\frac{1}{2}\right\}$, *e)* $\left\{-\frac{3}{2}, -4\right\}$, *f)* $\left\{\frac{1}{2}, -3\right\}$, *g)* $\left\{\frac{-5+\sqrt{13}}{6}, \frac{-5-\sqrt{13}}{6}\right\}$, *h) {2+4i,2-4i}, i)* $\left\{-\frac{1}{2}+i\frac{\sqrt{3}}{2}, -\frac{1}{2}-i\frac{\sqrt{3}}{2}\right\}$; *3) t=6 seconds*

Mini-Lecture 8.2

Solving Quadratic Equations by the Quadratic Formula

Learning Objectives:

1. Solve quadratic equations by using the quadratic formula.
2. Determine the number and type of solutions of a quadratic equation by using the discriminant.
3. Solve geometric problems modeled by quadratic equations.
4. Key vocabulary: *discriminant.*

Examples:

1. Use the quadratic formula to solve each equation.

   a) $x^2 + 5x + 6 = 0$ b) $x^2 + 4x - 7 = 0$ c) $3x^2 - 9x = -2$

   d) $5x^2 = -10x - 3$ e) $5x^2 = -8$ f) $9 + 3x(x - 2) = 8$

   g) $\frac{x^2}{18} + x + \frac{35}{9} = 0$ h) $(x + 8)(2x - 9) = 2(x - 1) - 72$

2. Use the discriminant to determine the number and types of solutions of each equation.

   a) $4x^2 - 8x + 4 = 0$ b) $6x^2 = 2x - 5$

   c) $x^2 + 8x + 7 = 0$ d) $10 - 5x^2 = 6x + 5$

3. Solve each equation by completing the square.
   c) ***Geometry*** A rectangular sign has an area of 21 square yards. Its length is 6 yards more than its width. Find the dimensions of the sign.
   d) ***Geometry*** The hypotenuse of a right triangle is 7 feet long. One leg of the triangle is 5 feet longer than the other leg. Find the perimeter of the triangle.
   e) ***Revenue*** The revenue for a small company is given by the quadratic function $r(t) = 14t^2 + 16t + 860$, where *t* is the number of years since 1998 and $r(t)$ is in thousands of dollars. Find the year in which the company's revenue will be \$1290 thousand. Round to the nearest whole year.

Teaching Notes:

- Encourage students to memorize the quadratic formula.
- Many students reduce final answers incorrectly. For example: $\frac{4 \pm \sqrt{5}}{8} \to \frac{1 \pm \sqrt{5}}{2}$.
- Some students prefer to always use the quadratic formula because it has no restrictions on when it can be used. Encourage them to master the other methods, which are often quicker and easier to apply.
- Refer students to the ***Discriminant*** chart in the text.

Answers: 1a) {-3,-2}, b) $\{-2 + \sqrt{11}, -2 - \sqrt{11}\}$, *c)* $\left\{\frac{9 + \sqrt{57}}{6}, \frac{9 - \sqrt{57}}{6}\right\}$, *d)* $\left\{\frac{-5 + \sqrt{10}}{5}, \frac{-5 - \sqrt{10}}{5}\right\}$, *e)* $\left\{\frac{2i\sqrt{10}}{5}, \frac{-2i\sqrt{10}}{5}\right\}$, *f)* $\left\{\frac{3 + \sqrt{6}}{3}, \frac{3 - \sqrt{6}}{3}\right\}$, *g)* $\{-9 + \sqrt{11}, -9 - \sqrt{11}\}$, *h)* $\left\{-\frac{1}{2}, -2\right\}$; *2a) one real solution, b) two complex but not real solutions, c) two real solutions, d) two real solutions; 3a)* $-3 + \sqrt{30}$ *yds by* $3 + \sqrt{30}$ *yds, b)* $7 + \sqrt{73}$ *ft, c) 2003*

Mini-Lecture 8.3

Solving Equations by Using Quadratic Methods

Learning Objectives:

1. Solve various equations that are quadratic in form.
2. Solve problems that lead to quadratic equations.

Examples:

1. Solve.

a) $x = 8 + 2\sqrt{x}$ b) $8y = \sqrt{1 - 12y}$ c) $\sqrt{22x + 11} = x + 6$

d) $\frac{6}{x} + \frac{1}{x-3} = 1$ e) $\frac{12}{x^2} = \frac{6}{x+8}$ f) $x^4 = 25$

g) $x^4 + 2x^2 - 24 = 0$ h) $2x^4 - 13x^2 - 45 = 0$ i) d) $x^{\frac{2}{3}} + 2x^{\frac{1}{3}} - 8 = 0$

j) $3x^{\frac{2}{3}} - 2x^{\frac{1}{3}} - 8 = 0$ k) $(3x-4)^2 - 9(3x-4) + 18 = 0$ l) $2 + \frac{5}{2x-1} = \frac{-2}{(2x-1)^2}$

2. Solve.

a) ***Number*** The product of a number and 8 less than the number is –15. Find the number.
b) ***Geometry*** The hypotenuse of a right triangle is 9 feet long. One leg of the triangle is 3 feet longer than the other leg. Find the perimeter of the triangle.
c) ***Combined Rate*** Two pipes can be used to fill a pool. Working together, the two pipes can fill the pool in 6 hrs. The larger pipe can fill the pool in 3 hours less than the smaller pipe can alone. Find the time to the nearest tenth of an hour it takes for the smaller pipe working alone to fill the pool.

Teaching Notes:

- Most students find this section difficult due to the various number of solutions that are possible.
- Remind students to check for extraneous solutions.
- Encourage students to draw a diagram or make a chart when solving applied problems.
- Refer students to the ***Solving a Quadratic Equation*** chart in the text.

Answers: 1a) {16}, b) $\left\{\frac{1}{16}\right\}$*, c) {5}; d)* $\{5+\sqrt{7}, 5-\sqrt{7}\}$*, e)* $\{1+\sqrt{17}, 1-\sqrt{17}\}$*; f)* $\{\sqrt{5}, -\sqrt{5}, i\sqrt{5}, -i\sqrt{5}\}$*, g)* $\{2, -2, i\sqrt{6}, -i\sqrt{6}\}$*,*
h) $\left\{3, -3, \frac{\sqrt{10}}{2}i, -\frac{\sqrt{10}}{2}i\right\}$*, i) {8,-64} ,j)* $\left\{8, -\frac{64}{27}\right\}$*, k)* $\left\{\frac{7}{3}, \frac{10}{3}\right\}$*, l)* $\left\{\frac{1}{4}, -\frac{1}{2}\right\}$*; 2a) 3 or 5, b) 21.37 ft, c) 13.7 hrs*

Mini-Lecture 8.4

Nonlinear Inequalities in One Variable

Learning Objectives:

1. Solve polynomial inequalities of degree 2 or greater.
2. Solve inequalities that contain rational expressions with variables in the denominator.
3. Key vocabulary: *standard form, related equation, test point.*

Examples:

1. Solve.

   a) $(x+2)(x+3)>0$

   b) $(x+2)(x+3)\le 0$

   c) $x^2-9x+18\ge 0$

   d) $5x^2-4x\ge 9$

   e) $x(x+6)(x-2)<0$

   f) $(x+1)(x-3)(x-6)>0$

   g) $(x^2-36)(x^2-4)\le 0$

   h) $16x^3+48x^2-25x-75>0$

2. Solve.

   a) $\dfrac{x+5}{x-3}<0$

   b) $\dfrac{x-7}{x-2}>0$

   c) $\dfrac{4}{y-3}\le 0$

   d) $\dfrac{-3}{y+4}\ge 3$

   e) $\dfrac{(x+5)(x-5)}{x}<0$

   f) $\dfrac{(3-x)(x-1)}{(x-2)^2}\ge 0$

   g) $\dfrac{4x}{x+6}<x$

   h) $\dfrac{(x-3)^2}{x^2-25}>0$

Teaching Notes:

- Many students understand the concepts of this section better if they are shown a graph of the quadratic function in 1a) and b) and can see where the parabola is above or below the x-axis.
- Some students are confused by how to pick test points. Remind them that they can pick any convenient point except for the critical points that define regions.
- Encourage students to make a region chart as in the textbook examples.
- Refer students to the ***Solving a Polynomial Inequality of Degree 2 or Higher*** and ***Solving a Rational Inequality*** charts in the text.

Answers: 1a) $(-\infty,-3)\cup(-2,\infty)$, *b) [-3,-2], c)* $(-\infty,3]\cup[6,\infty)$, *d)* $(-\infty,-1]\cup\left[\frac{9}{5},\infty\right)$, *e)* $(-\infty,-6)\cup(0,2)$, *f)* $(-1,3)\cup(6,\infty)$, *g)* $[-6,-2]\cup[2,6]$, *h)* $\left(-3,-\frac{5}{4}\right)\cup\left(\frac{5}{4},\infty\right)$; *2a) (-5,3), b)* $(-\infty,2)\cup(7,\infty)$, *c)* $(-\infty,3)$, *d)* $[-5,-4)$, *e)* $(-\infty,-5)\cup(0,5)$, *f)* $[1,2)\cup(2,3]$, *g)* $(-6,-2)\cup(0,\infty)$, *h)* $(-\infty,-5)\cup(5,\infty)$

Mini-Lecture 8.5

Quadratic Functions and Their Graphs

Learning Objectives:

1. Graph quadratic functions of the form $f(x) = x^2 + k$.
2. Graph quadratic functions of the form $f(x) = (x - h)^2$.
3. Graph quadratic functions of the form $f(x) = (x - h)^2 + k$.
4. Graph quadratic functions of the form $f(x) = ax^2$.
5. Graph quadratic functions of the form $f(x) = a(x - h)^2 + k$.
6. Key vocabulary: *vertex, axis of symmetry.*

Examples:

1. Graph each quadratic function. Label the vertex and sketch and label the axis of symmetry.

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

2. Graph each quadratic function. Label the vertex and sketch and label the axis of symmetry.

   a) $f(x) = (x - 2)^2$ b) $f(x) = (x + 3)^2$

3. Graph each quadratic function. Label the vertex and sketch and label the axis of symmetry.

   a) $f(x) = (x - 2)^2 + 1$ b) $f(x) = (x + 1)^2 - 3$

4. Graph each quadratic function. Label the vertex and sketch and label the axis of symmetry.

   a) $f(x) = 2x^2$ b) $f(x) = \frac{1}{2}x^2$

   c) $f(x) = -x^2$ d) $f(x) = -3x^2$

5. Graph each quadratic function. Label the vertex and sketch and label the axis of symmetry.

   a) $f(x) = 2(x + 1)^2$ b) $f(x) = \frac{1}{2}(x - 2)^2 + 1$

   c) $f(x) = -2(x - 3)^2 + 4$ d) $f(x) = \frac{1}{3}(x + 3)^2 - 2$

Teaching Notes:

- Most students find vertical shifts easy to understand.
- Some students are confused by the direction of a horizontal shift.
- Many students are uncertain of how to quickly determine the vertex until they have seen the graphs in objective 5 and can visualize how the vertex is (h, k)
- Refer students to the many graphing charts in the text.

Answers: (graph answers at end of mini-lectures) 1a) (0,0), x=0, b) (0,2), x=0, c) (0,-3), x=0; 2a) (2,0), x=2, b) (-3,0), x=-3; 3a) (2,1), x=2, b) (-1,-3), x=-1; 4a) (0,0), x=0, b) (0,0), x=0, c) (0,0), x=0, d) (0,0), x=0; 5a) (-1,0), x=-1, b) (2,1), x=2, c) (3,4), x=3, d) (-3,-2), x=-3

Mini-Lecture 8.6

Further Graphing of Quadratic Functions

Learning Objectives:

1. Write quadratic functions in the form $f(x) = a(x-h)^2 + k$.
2. Derive a formula for finding the vertex of a parabola.
3. Graph quadratic functions by graphing the vertex and all intercepts.
4. Find the minimum or maximum values of quadratic functions.

Examples:

1. Find the vertex of the graph of each quadratic function by completing the square.

   a) $f(x) = x^2 + 6x + 9$ b) $f(x) = -2x^2 + 4x + 6$ c) $f(x) = x^2 + x + 6$

2. Find the vertex of the graph of each quadratic function. Determine whether the graph opens upward or downward, find any intercepts, and graph the function.

   a) $f(x) = x^2 + 5x + 4$

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

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

   d) $f(x) = x^2 - 4x + 4$

   e) $f(x) = 2x^2 + 4x + \frac{5}{2}$

   f) $f(x) = \frac{1}{4}x^2 + 2x + \frac{9}{4}$

3. Solve.

   a) ***Number*** Find two numbers whose sum is 44 and whose product is as large as possible.

   b) ***Geometry*** The length and width of a rectangle must have a sum of 94 feet. Find the dimensions of the rectangle whose area is as large as possible.

   c) ***Projectile*** An arrow is fired into the air with an initial velocity of 96 feet per second. The height in feet of the arrow *t* seconds after it was shot into the air is given by the function $h(x) = -16t^2 + 96t$. Find the maximum height of the arrow.

Teaching Notes:

- Most students need to be reminded of the completing the square procedure.
- Most students are comfortable using the vertex formula but some are confused at first by why the calculated value must be substituted back into the quadratic function.
- Remind students to always check that their graph opens in the expected direction.

Answers: (graph answers at end of mini-lectures) 1a) (-3,0), b) (1,8), c) $\left(-\frac{1}{2}, \frac{23}{4}\right)$*; 2a)* $\left(-\frac{5}{2}, -\frac{9}{4}\right)$*, opens up, x-int (-4,0), (-1,0), y-int (0,4), b) (1,9), opens down, x-int (-2,0), (4,0), y-int (0,8), c) (2,8), opens down, x-int (0,0), (4,0), y-int (0,0), d) (2,0), opens up, x-int (2,0), y-int (0,4), e)* $\left(-1, \frac{1}{2}\right)$*, opens up, no x-int, y-int* $\left(0, \frac{5}{2}\right)$*, f)* $\left(-4, -\frac{7}{4}\right)$*, opens up, x-int* $\left(-4+\sqrt{7}, 0\right), (-4-\sqrt{7}, 0)$*, y-int* $\left(0, \frac{9}{4}\right)$*; 3a) 22 and 22, b) 47 ft by 47 ft, c) 144 ft*

Additional Exercises 8.1
Form I

Name _____

Date _____

Use the square root property to solve each equation.

1. $x^2 = 25$ **1.** _____

2. $x^2 = 16$ **2.** _____

3. $y^2 = 81$ **3.** _____

4. $x^2 - 32 = 4$ **4.** _____

5. $3z^2 - 27 = 0$ **5.** _____

6. $x^2 - 11 = 0$ **6.** _____

7. $(y-3)^2 = 4$ **7.** _____

Add the proper constant to each binomial so that the resulting trinomial is a perfect square trinomial. Then factor the trinomial.

8. $x^2 + 16x$ **8.** _____

9. $y^2 - 12y$ **9.** _____

10. $a^2 + 10a$ **10.** _____

11. $z^2 + 2z$ **11.** _____

Solve each equation by completing the square.

12. $x^2 - 6x = -9$ **12.** _____

13. $x^2 - 4x = 21$ **13.** _____

14. $x(x-6) = 16$ **14.** _____

15. $y^2 + 8y = -15$ **15.** _____

Additional Exercises 8.1
Form II

Name _____

Date _____

Use the square root property to solve each equation.

1. $x^2 = 144$ **1.** _____

2. $y^2 = 7$ **2.** _____

3. $x^2 - 12 = 0$ **3.** _____

4. $(z+5)^2 = 9$ **4.** _____

5. $(2z-3)^2 = 25$ **5.** _____

6. $x^2 + 9 = 0$ **6.** _____

7. $y^2 + 4 = 0$ **7.** _____

Add the proper constant to each binomial so that the resulting trinomial is a perfect square trinomial. Then factor the trinomial.

8. $x^2 + 14x$ **8.** _____

9. $z^2 - 18z$ **9.** _____

10. $r^2 - 20r$ **10.** _____

11. $x^2 + x$ **11.** _____

Solve each equation by completing the square.

12. $x^2 + 6x = -8$ **12.** _____

13. $2x^2 - 2x = 3$ **13.** _____

14. $4x^2 = 9x$ **14.** _____

15. $y^2 + 2y - 5 = 0$ **15.** _____

Additional Exercises 8.1
Form III

Name _____

Date _____

Use the square root property to solve each equation.

1. $y^2 = 145$ **1.** _____

2. $x^2 - 6 = 25$ **2.** _____

3. $(2x-3)^2 = 18$ **3.** _____

4. $(x+10)^2 = 11$ **4.** _____

5. $2z^2 + 16 = 0$ **5.** _____

6. $(x-1)^2 = -16$ **6.** _____

7. $(z-4)^2 = -18$ **7.** _____

Add the proper constant to each binomial so that the resulting trinomial is a perfect square trinomial. Then factor the trinomial.

8. $x^2 + 9x$ **8.** _____

9. $p^2 - 5p$ **9.** _____

10. $y^2 - y$ **10.** _____

11. $r^2 + 7r$ **11.** _____

Solve each equation by completing the square.

12. $x^2 + x - 7 = 0$ **12.** _____

13. $3y^2 + 2y - 4 = 0$ **13.** _____

14. $3p^2 - 12p + 2 = 0$ **14.** _____

15. $4x^2 - 6x - 15 = 0$ **15.** _____

Additional Exercises 8.2
Form I

Name _____

Date _____

Use the quadratic formula to solve each equation.

1. $x^2+8x+15=0$ — **1.** _____

2. $r^2+5r-6=0$ — **2.** _____

3. $y^2-6y+9=0$ — **3.** _____

4. $x^2+10x+25=0$ — **4.** _____

5. $\frac{2}{5}y^2+\frac{1}{5}y-\frac{3}{5}=0$ — **5.** _____

6. $x^2-4x=1$ — **6.** _____

7. $x^2+5=2x$ — **7.** _____

8. $x^2+4=0$ — **8.** _____

9. $x^2+2x+2=0$ — **9.** _____

10. $y^2-8=4y$ — **10.** _____

11. $6y+1=-y^2$ — **11.** _____

12. $(m+2)(m-6)=-12$ — **12.** _____

Use the discriminant to determine the number and types of solutions of each equation.

13. $x^2-5=0$ — **13.** _____

14. $x^2-12=0$ — **14.** _____

15. $4y^2+12y=-9$ — **15.** _____

Additional Exercises 8.2
Form II

Name _____

Date _____

Use the quadratic formula to solve each equation.

1. $x^2 - 6x = -10$ **1.** _____

2. $8y^2 + 1 = 4y$ **2.** _____

3. $2x^2 - 3x = 1$ **3.** _____

4. $2y^2 = 2y - 1$ **4.** _____

5. $5z^2 = 2z - 3$ **5.** _____

6. $1 - 2z = 4z^2$ **6.** _____

7. $4x^2 + 9 = 12x$ **7.** _____

8. $6(r^2 - 1) = 5r$ **8.** _____

9. $x^2 + 4x = -2$ **9.** _____

10. $x^2 + x = 4$ **10.** _____

11. $x(2x + 9) = 5$ **11.** _____

12. $\frac{1}{2}x^2 = x - \frac{1}{2}$ **12.** _____

Use the discriminant to determine the number and types of solutions of each equation.

13. $9r^2 + 1 = 6r$ **13.** _____

14. $3x = -2x^2 + 5$ **14.** _____

15. $8 = 4x - 5x^2$ **15.** _____

Additional Exercises 8.2
Form III

Name _____

Date _____

Use the quadratic formula to solve each equation.

1. $3x^2 - 7x - 3 = 0$ **1.** _____

2. $8y^2 - 2y - 9 = 0$ **2.** _____

3. $\frac{1}{2}x^2 + 3x + 1 = 0$ **3.** _____

4. $r(r+5) = 5$ **4.** _____

5. $15x^2 + 15x + 5 = 0$ **5.** _____

6. $\frac{1}{4}x^2 - 5 + 2x = 0$ **6.** _____

7. $\frac{1}{4}y^2 - \frac{1}{2}y = -\frac{1}{4}$ **7.** _____

8. $(x-6)(x-3) = 2$ **8.** _____

9. $s(5s+3) = 2$ **9.** _____

10. $(x-4)^2 = 2x$ **10.** _____

11. $\left(a + \frac{1}{2}\right)^2 = \frac{a}{2}$ **11.** _____

12. $4y^2 + 5y + 2 = 0$ **12.** _____

Use the discriminant to determine the number and types of solutions of each equation.

13. $9x^2 + 8x = 3$ **13.** _____

14. $5 - 2y^2 + 9y = 0$ **14.** _____

15. $4 - 3x + 12x^2 = 0$ **15.** _____

Additional Exercises 8.3
Form I

Name _____

Date _____

Solve.

1. $x = \sqrt{6x - 13}$ **1.** _____

2. $x^4 - 25 = 0$ **2.** _____

3. $x^4 - 4x^2 + 3 = 0$ **3.** _____

4. $2x = \sqrt{4 - 5x}$ **4.** _____

5. $x - \sqrt{7x - 12} = 0$ **5.** _____

6. $\sqrt{12x} = x + 3$ **6.** _____

7. $\frac{2}{x-1} + \frac{3}{x+1} = 1$ **7.** _____

8. $\frac{3}{x} + \frac{4}{x+1} = 2$ **8.** _____

9. $a^4 - 12a^2 + 32 = 0$ **9.** _____

10. $4x^4 + 28x^2 + 48 = 0$ **10.** _____

11. $2x = \sqrt{16x - 64}$ **11.** _____

12. $x^3 + 3x^2 + 4x + 12 = 0$ **12.** _____

13. $x^{2/3} - 7x^{1/3} + 6 = 0$ **13.** _____

14. $x^{2/3} - 2x^{1/3} - 15 = 0$ **14.** _____

15. $x - \sqrt{4x} = 3$ **15.** _____

Additional Exercises 8.3
Form II

Name _____

Date _____

Solve.

1. $x^4 + 10x^2 + 9 = 0$ **1.** _____

2. $4 - \frac{1}{x} - \frac{2}{x^2} = 0$ **2.** _____

3. $\frac{3}{x} = \frac{2x}{x-1}$ **3.** _____

4. $\frac{5}{x^2} = 3 + \frac{8}{x}$ **4.** _____

5. $\frac{4}{y} + 3 = -\frac{2}{y^2}$ **5.** _____

6. $x^2 + \sqrt{12}\,x = 1$ **6.** _____

7. $z = 4 + \frac{2}{z}$ **7.** _____

8. $\frac{1}{2}x^2 = \sqrt{2}\,x + 1$ **8.** _____

9. $\frac{1}{y^2 - 3y + 2} = \frac{1}{y+2} + \frac{5}{y^2 - 4}$ **9.** _____

10. $\frac{1}{r+1} - \frac{1}{r} = \frac{1}{2}$ **10.** _____

11. $\sqrt{2}\,x^2 + 3x = 2\sqrt{2}$ **11.** _____

12. $x^{2/3} - 6x^{1/3} = -8$ **12.** _____

13. $y^{-2} - 4y^{-1} = 3$ **13.** _____

14. $\left(y - \frac{3}{y}\right)^2 - \left(y - \frac{3}{y}\right) - 2 = 0$ **14.** _____

15. $9x^4 + 5x^2 - 4 = 0$ **15.** _____

Additional Exercises 8.3
Form III

Name _____

Date _____

Solve.

1. $\sqrt{-5x^2-4}=x^2$ **1.** _____

2. $\sqrt{2x+3}-\sqrt{x+1}=1$ **2.** _____

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

4. $\sqrt{2y+3}=y-1$ **4.** _____

5. $d^4-14d^2+40=0$ **5.** _____

6. $\dfrac{3}{x-3}+\dfrac{4}{x+3}=2$ **6.** _____

7. $\dfrac{5}{x^2-6x+5}=\dfrac{x}{x-1}-\dfrac{2x}{x-5}$ **7.** _____

8. $\dfrac{7}{2x^2-3x-20}=\dfrac{4}{2x+5}+\dfrac{x}{x-4}$ **8.** _____

9. $4x^4-11x^2=3$ **9.** _____

10. $5x^4+6x^2-8=0$ **10.** _____

11. $(3x-1)^2+4(3x-1)+5=0$ **11.** _____

12. $2x^{2/3}-9x^{1/3}=5$ **12.** _____

13. $3x^{2/3}-12x^{1/3}=14$ **13.** _____

14. $15x^{2/3}-27x^{1/3}+20=0$ **14.** _____

15. $3+\dfrac{2}{4b+3}=\dfrac{4}{b+5}$ **15.** _____

Additional Exercises 8.4
Form I

Name _____

Date _____

Solve each quadratic inequality. Write the solution set in interval notation.

1. $(x+1)(x+3)>0$ **1.** _____

2. $(x-2)(x+2)\geq 0$ **2.** _____

3. $(x-4)(x-2)<0$ **3.** _____

4. $(x-5)(x+3)\leq 0$ **4.** _____

5. $(x+4)(x-6)>0$ **5.** _____

6. $x^2+4x+3\geq 0$ **6.** _____

7. $x^2-7x+12\leq 0$ **7.** _____

8. $2x^2+2x\leq 12$ **8.** _____

9. $2x^2-3x>5$ **9.** _____

10. $(x+1)(x+3)(x+5)>0$ **10.** _____

11. $(x+2)(x-3)(x-4)\leq 0$ **11.** _____

12. $x(x-3)(x-5)\geq 0$ **12.** _____

13. $(x^2-4)(x^2-9)\leq 0$ **13.** _____

14. $(x^2-16)(x^2-4)>0$ **14.** _____

15. $\dfrac{x+3}{x+4}\geq 0$ **15.** _____

Additional Exercises 8.4
Form II

Name _____

Date _____

Solve each quadratic inequality. Write the solution set in interval notation.

1. $(x-5)(x-2)>0$ — **1.** _____

2. $x(2x+7)<4$ — **2.** _____

3. $x^2-4x+3\geq 0$ — **3.** _____

4. $3y^2+10y\leq 8$ — **4.** _____

5. $2m^2+m<15$ — **5.** _____

6. $-3>4x^2+7x$ — **6.** _____

7. $5u\leq 2-3u^2$ — **7.** _____

8. $x(x-2)(x+4)\leq 0$ — **8.** _____

9. $(x^2-4)(x^2-25)>0$ — **9.** _____

10. $\frac{x+3}{x+4}<0$ — **10.** _____

11. $\frac{x-2}{x+2}\leq 2$ — **11.** _____

12. $\frac{x}{x+5}\leq 1$ — **12.** _____

13. $\frac{x+3}{x-7}>0$ — **13.** _____

14. $\frac{x}{2x-1}\leq 3$ — **14.** _____

15. $\frac{x+2}{x-4}\geq 1$ — **15.** _____

Additional Exercises 8.4
Form III

Name _____

Date _____

Solve each quadratic inequality. Write the solution set in interval notation.

1. $\frac{3x-5}{x+2} \le 2$ — **1.** _____

2. $\frac{x-4}{2x+4} \ge 1$ — **2.** _____

3. $x^3 + 2x^2 - 9x - 18 \ge 0$ — **3.** _____

4. $\frac{(x+8)(x-3)}{x-1} \le 0$ — **4.** _____

5. $\frac{6x}{5-x} > 3x$ — **5.** _____

6. $2x^2 - 3x \le 20$ — **6.** _____

7. $3x^2 - 25x > -28$ — **7.** _____

8. $(3x-2)(5x+3) \le 0$ — **8.** _____

9. $\frac{x-3}{x+2} \ge 4x$ — **9.** _____

10. $\frac{4}{x-3} < 5$ — **10.** _____

11. $\frac{x^2+5}{2x} \le 3$ — **11.** _____

12. $\frac{x^2+24}{7x} \ge 2$ — **12.** _____

13. $x^3 - 3x^2 - 4x + 12 < 0$ — **13.** _____

14. $x^4 - 25x^2 + 144 \le 0$ — **14.** _____

15. $\frac{x(x-5)}{(x+6)(x-2)} \ge 0$ — **15.** _____

Additional Exercises 8.5
Form I

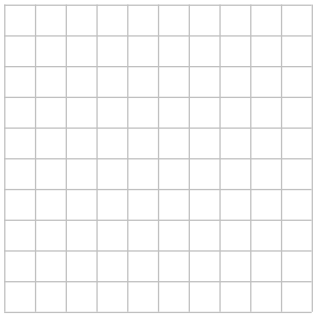
Name _____

Date _____

Sketch the graph of each quadratic function. Label the vertex, and sketch and label the axis of symmetry.

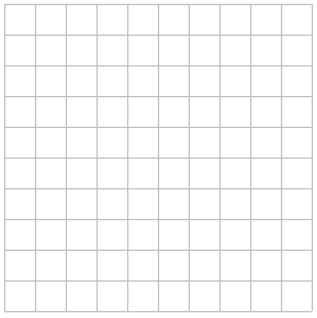
1. $f(x) = x^2 + 1$

1.



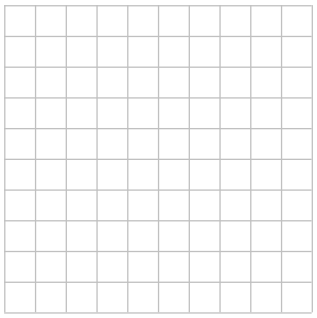
2. $g(x) = x^2 - 3$

2.



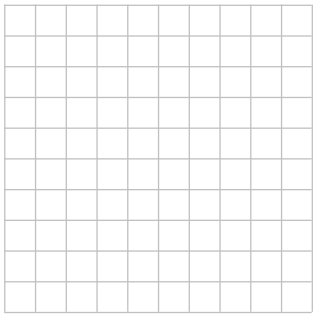
3. $h(x) = x^2 - 5$

3.



4. $h(x) = x^2 + 4$

4.

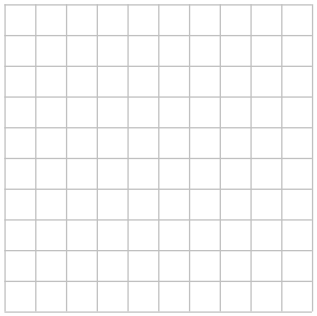


Additional Exercises 8.5 (*cont.*)

Name _____

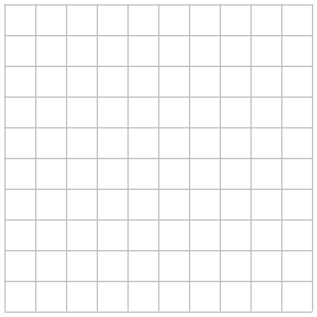
5. $f(x) = (x-4)^2$

5.



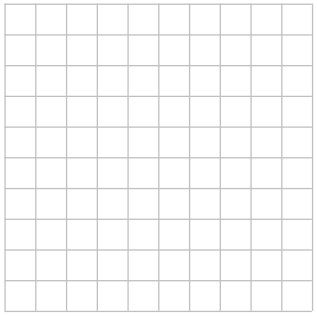
6. $g(x) = (x+4)^2$

6.



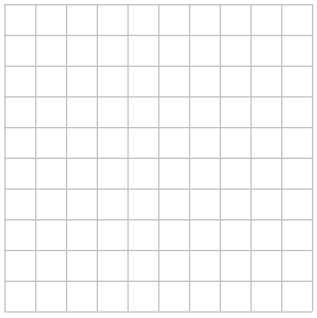
7. $f(x) = (x-2)^2$

7.



8. $h(x) = (x+1)^2$

8.

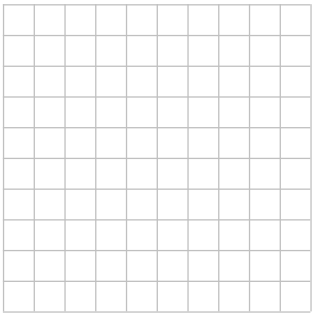


Additional Exercises 8.5 (*cont.*)

Name _____

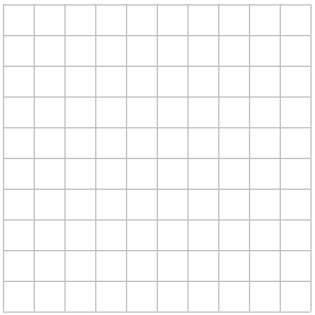
9. $f(x) = 3x^2$

9.



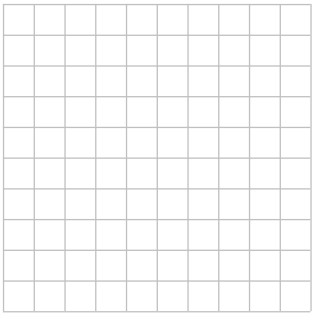
10. $g(x) = \frac{1}{2}x^2$

10.



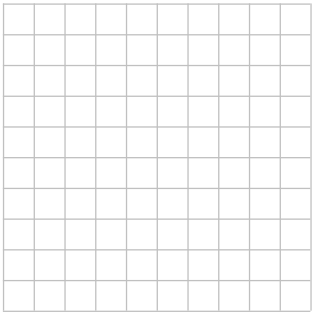
11. $h(x) = -2x^2$

11.



12. $g(x) = -\frac{1}{4}x^2$

12.



Additional Exercises 8.5
Form II

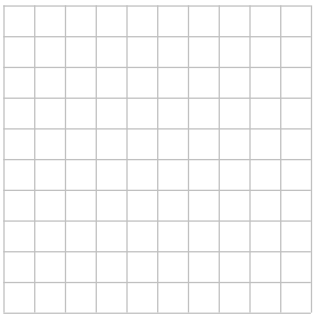
Name _____

Date _____

Sketch the graph of each quadratic function. Label the vertex, and sketch and label the axis of symmetry.

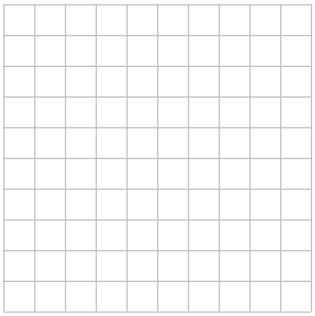
1. $f(x) = x^2 - 7$

1.



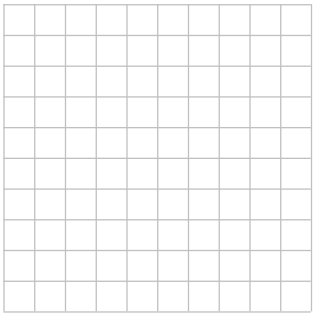
2. $g(x) = (x+6)^2$

2.



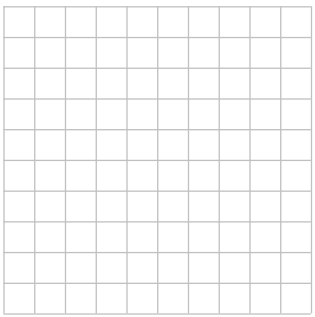
3. $h(x) = (x+2)^2 + 2$

3.



4. $h(x) = (x+6)^2 - 1$

4.

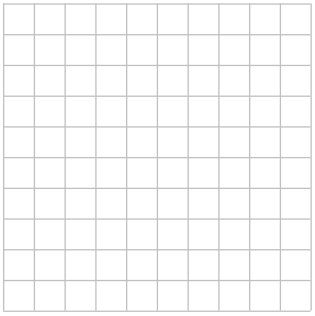


Additional Exercises 8.5 (*cont.*)

Name _____

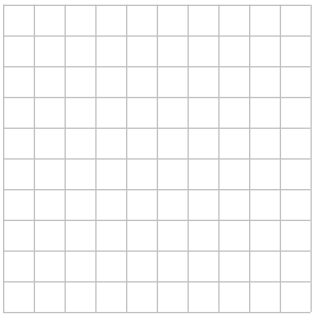
5. $f(x) = (x-3)^2 - 4$

5.



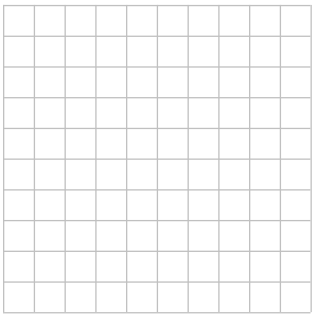
6. $g(x) = (x-2)^2 + 3$

6.



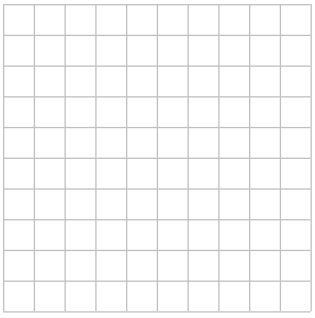
7. $f(x) = -4x^2$

7.



8. $h(x) = \frac{1}{5}x^2$

8.

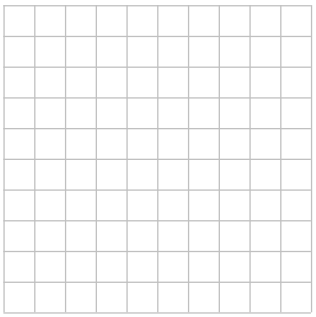


Additional Exercises 8.5 (*cont.*)

Name _____

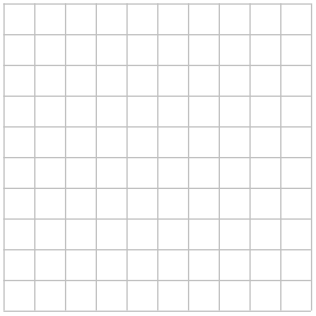
9. $f(x) = 3(x-1)^2 + 1$

9.



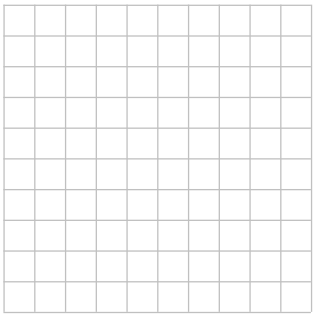
10. $g(x) = -2(x+2)^2 - 3$

10.



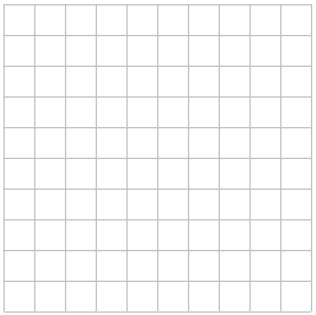
11. $h(x) = -3(x-1)^2 + 4$

11.



12. $g(x) = \frac{1}{2}(x+4)^2 + 5$

12.



Additional Exercises 8.5
Form III

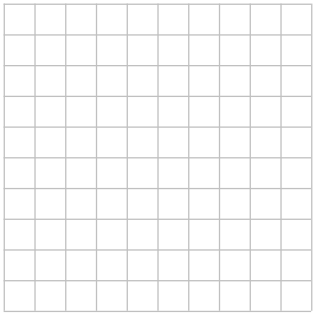
Name _____

Date _____

Sketch the graph of each quadratic function. Label the vertex, and sketch and label the axis of symmetry.

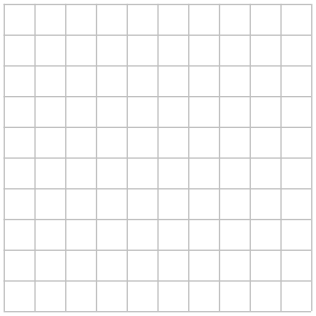
1. $f(x) = (x-4)^2 - 15$

1.



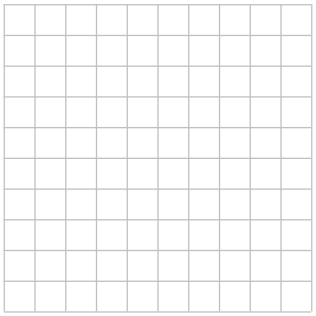
2. $f(x) = (x-3)^2 - 9$

2.



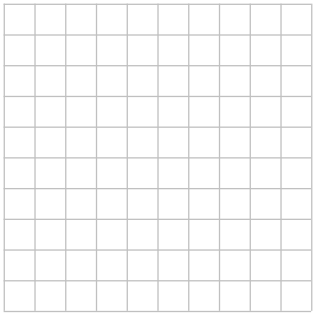
3. $g(x) = \left(x - \frac{1}{2}\right)^2 + \frac{3}{4}$

3.



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

4.

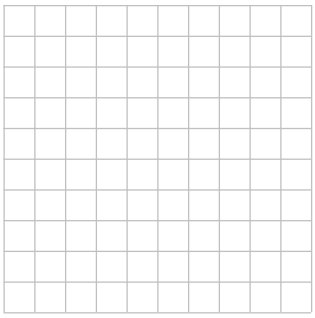


Additional Exercises 8.5 (*cont.*)

Name _____

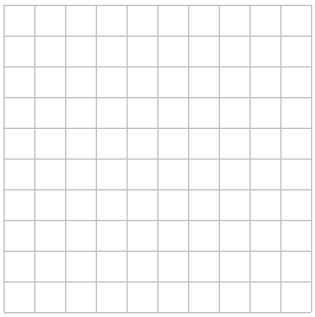
5. $G(x) = -2\left(x - \frac{3}{2}\right)^2 + \frac{13}{2}$

5.



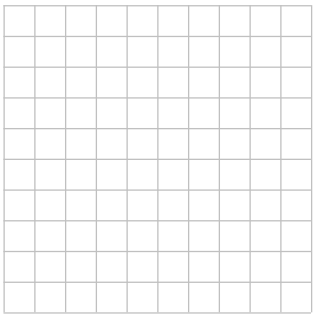
6. $f(x) = \frac{1}{2}(x+1)^2 - \frac{3}{2}$

6.



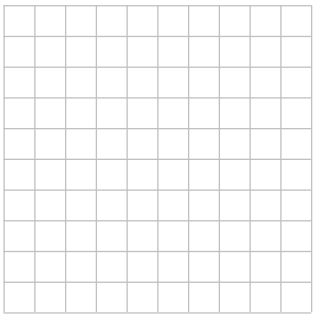
7. $f(x) = \frac{1}{2}x^2 + 9$

7.



8. $h(x) = \frac{2}{3}x^2 - 5$

8.

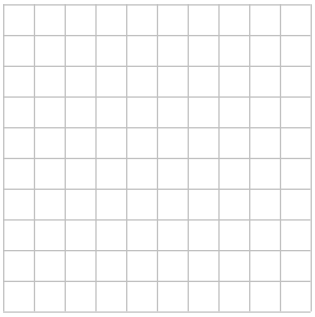


Additional Exercises 8.5 (*cont.*)

Name _____

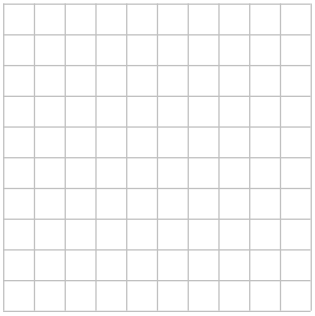
9. $f(x) = 4\left(x + \frac{1}{2}\right)^2$

9.



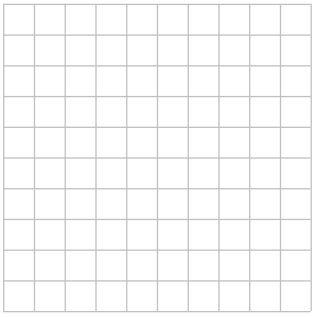
10. $g(x) = -4\left(x - \frac{1}{3}\right)^2$

10.



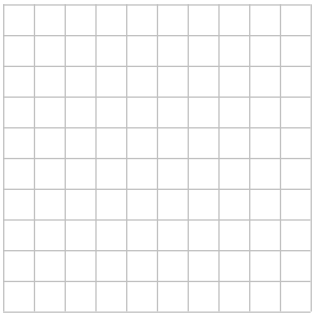
11. $h(x) = \sqrt{2}(x-5)^2 + \frac{3}{4}$

11.



12. $g(x) = \sqrt{5}(x-6)^2 + \frac{1}{2}$

12.



Additional Exercises 8.6
Form I

Name _____

Date _____

Find the vertex of the graph of each quadratic function

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

2. $f(x) = x^2 - 6x + 9$

3. $h(x) = x^2 - 6x + 5$

4. $f(x) = x^2 + 6x + 8$

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

1. _____

2. _____

3. _____

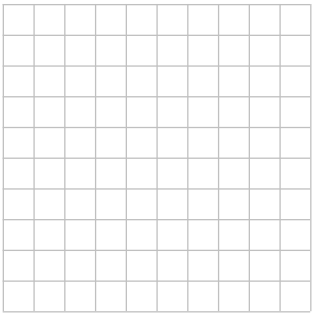
4. _____

5. _____

Find the vertex of the graph of each quadratic function. Determine whether the graph opens upward or downward, find any intercepts, and sketch the graph.

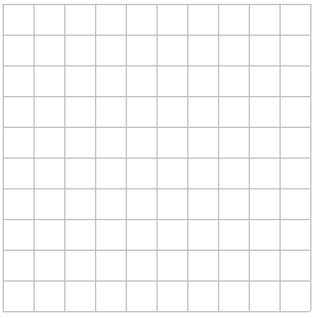
6. $f(x) = x^2 - 5x + 4$

6.



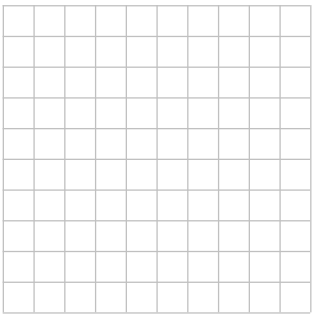
7. $f(x) = x^2 + 2x + 1$

7.



8. $f(x) = x^2 - 9$

8.

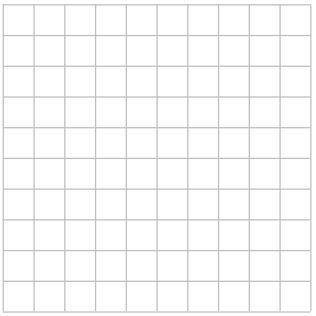


Additional Exercises 8.6 (*cont.*)

Name _____

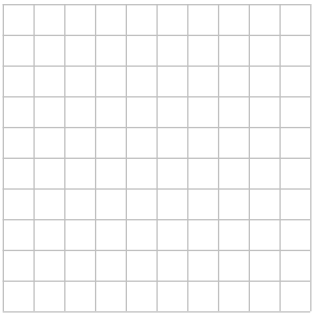
9. $f(x) = x^2 - 16$

9.



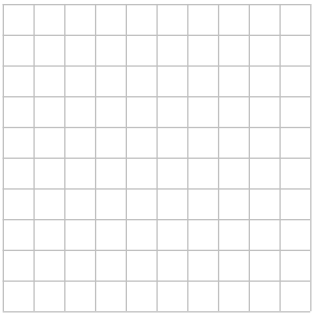
10. $f(x) = x^2 + 4$

10.



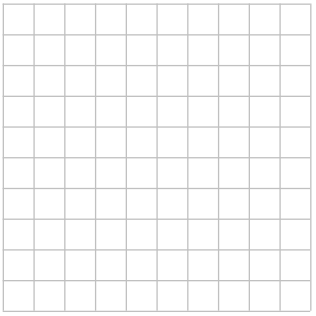
11. $f(x) = -x^2 - 6x - 5$

11.



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

12.



Additional Exercises 8.6
Form II

Name _____

Date _____

Find the vertex of the graph of each quadratic function

1. $f(x) = 2x^2 - x + 2$ **1.** _____

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

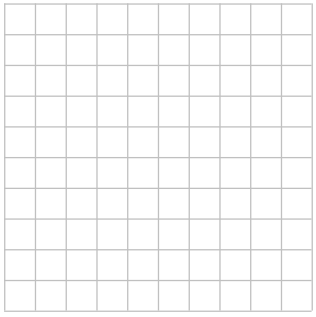
3. $H(x) = x^2 + 2x - 8$ **3.** _____

4. $G(x) = x^2 - 2x - 3$ **4.** _____

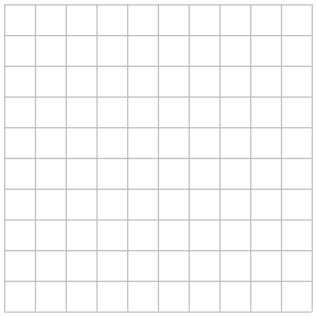
5. $h(x) = -x^2 + 4x - 4$ **5.** _____

Find the vertex of the graph of each quadratic function. Determine whether the graph opens upward or downward, find any intercepts, and sketch the graph.

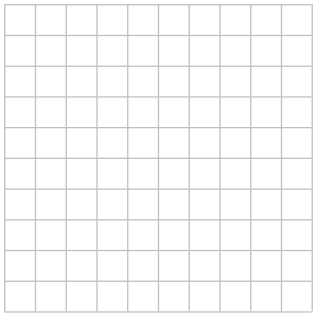
6. $f(x) = x^2 - 7x - 8$ **6.**



7. $f(x) = x^2 + 2x$ **7.**



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

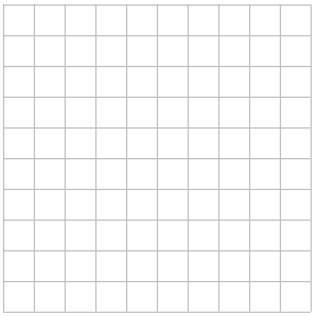


Additional Exercises 8.6 (*cont.*)

Name _____

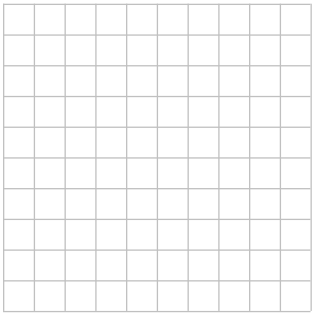
9. $f(x) = -4x^2 + 1$

9.



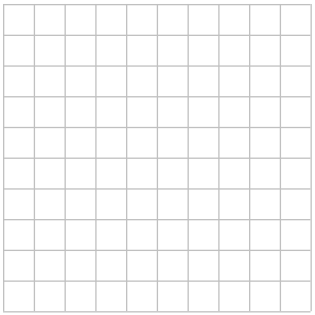
10. $f(x) = -2x^2 - 5x + 3$

10.



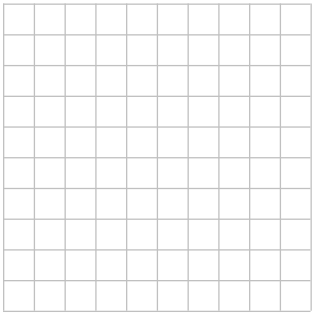
11. $f(x) = -x^2 - 3x + 4$

11.



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

12.



Additional Exercises 8.6
Form III

Name _____

Date _____

Find the vertex of the graph of each quadratic function

1. $f(x) = \frac{2}{3}x^2 + \frac{4}{3}x - 1$

1. _____

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

2. _____

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

3. _____

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

4. _____

5. $f(x) = 3x^2 - 17x + 20$

5. _____

Find the vertex of the graph of each quadratic function. Determine whether the graph opens upward or downward, find any intercepts, and sketch the graph.

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

6.

7. $f(x) = -3x^2 + 15x$

7.

8. $f(x) = \frac{1}{2}x^2 + 3x + 4$

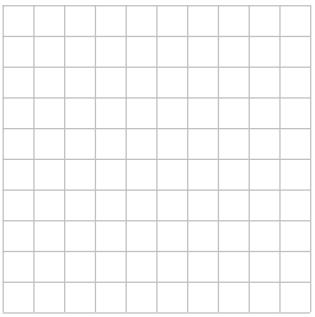
8.

Additional Exercises 8.6 (*cont.*)

Name _____

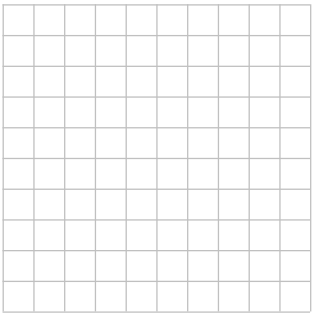
9. $f(x) = -\frac{1}{4}x^2 + 2x + 1$

9.



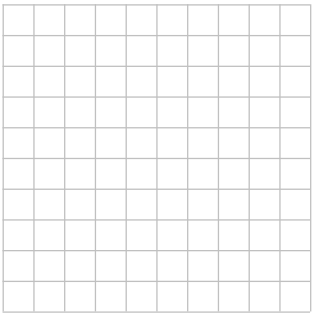
10. $f(x) = 3x^2 + 4x + 9$

10.



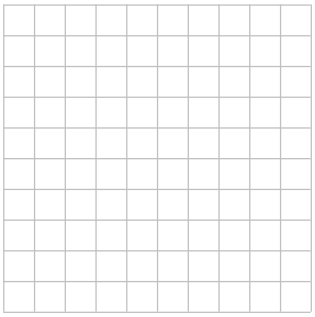
11. $f(x) = -2x^2 - 3x + 12$

11.



12. $f(x) = -3x^2 + 13x - 10$

12.



Name: **Date:**
Instructor: **Section:**

Section 8.2 Solving Quadratic Equations by the Quadratic Formula

Objective: Derive the quadratic formula.
Suggested Format: Small group format.
Time: 15 minutes

Study pages 489 – 490. Then close the book and your notes and use the completing the square method on the equation $ax^2 + bx + c = 0$ to derive the quadratic formula.

Name: **Date:**
Instructor: **Section:**

Section 8.5 Quadratic Functions and Their Graphs

Objective: Use the a quadratic equation with real life data.
Suggested Format: Small Group
Time: 20 minutes

A manufacturing company found the that the equation $f(x) = -3.2x^2 + 268.2x + 257$ could be used to approximate their profit per day for x items produced.

1. Find the profit if 40 items are made.

2. Find the profit if 50 items are made.

3. How many objects would need to be made to get a profit of $5423?

4. How many objects should be sold to maximize profit?

5. What is the maximum profit?

Name: **Date:**
Instructor: **Section:**

Chapter 8 Test Form A

Solve by completing the square.

1. $x^2 + 2x - 3 = 0$ **1.** _____

2. $3x^2 + 6x - 15 = 0$ **2.** _____

Solve using an appropriate technique.

3. $(x-3)^2 = 27$ **3.** _____

4. $x^2 + 7x - 60 = 0$ **4.** _____

5. $3x^2 - 8x - 16 = 0$ **5.** _____

6. $x^2 - 14x + 50 = 0$ **6.** _____

7. $10x^2 - 11x - 6 = 0$ **7.** _____

8. $2y^2 - 6y = 1$ **8.** _____

9. $x^3 - 8 = 0$ **9.** _____

10. $x^4 - 10x^2 + 24 = 0$ **10.** _____

11. $\dfrac{x}{x-1} = \dfrac{1}{x+1} + \dfrac{3}{x^2-1}$ **11.** _____

12. $\dfrac{1}{3}x^2 = 2x + 1$ **12.** _____

13. $(x-2)^2 + (x-2) - 12 = 0$ **13.** _____

Solve the inequality and write the solution in interval notation.

14. $x^2 - 3x - 10 \le 0$ **14.** _____

15. $\dfrac{3}{x-5} < 0$ **15.** _____

16. $\dfrac{x-3}{x+5} > 0$ **16.** _____

Chapter 8 Test Form A *cont'd*

17. $\dfrac{x+1}{x+3} > 2$ **17.** _____

18. A square picture frame will hold a poster with an area of 196 square inches. Find the dimensions of the frame. **18.** _____

19. A whole number increased by its square is 4 times itself. Find the number. **19.** _____

20. A ball is thrown upward from a 100-foot tall building with an initial velocity of 14 feet per second. Its height $s(t)$ is given by the function $s(t) = -16t^2 + 14t + 100$. Find the interval of time for which the ball is greater than 103 feet. **20.** _____

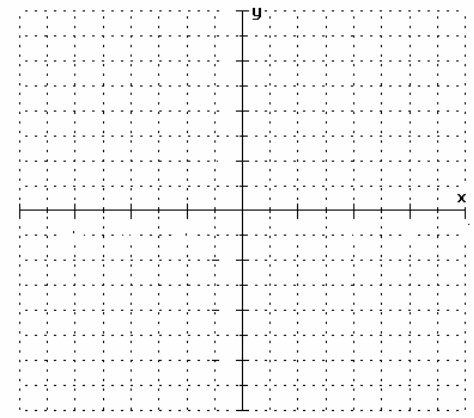
21. Write the equation of a parabola with the shape as $f(x) = -2x^2$ but with the vertex (−3, 2). **21.** _____

22. Find the vertex of the graph of $f(x) = 3x^2 - 12x + 5$ and determine whether the graph opens upward or downward. **22.** _____

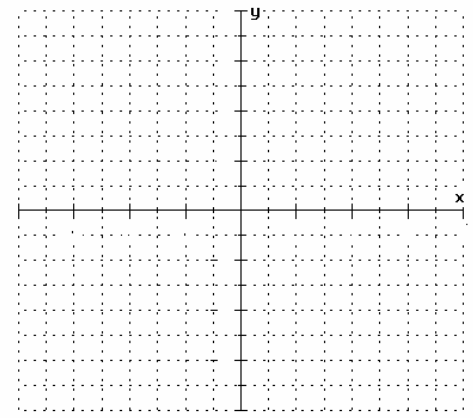
Chapter 8 Test Form A *cont'd*

Give the vertex, determine whether the graph opens upward or downward, and graph.

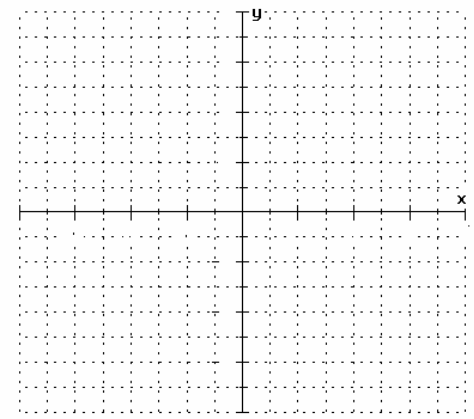
23. $y = x^2 + 2x - 8$



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



25. Give the vertex and x-intercepts and graph. $f(x) = -x^2 + 3x + 2$



Name: **Date:**
Instructor: **Section:**

Chapter 8 Test Form B

Solve by completing the square.

1. $x^2+4x-2=0$ **1.** _____

2. $3x^2-2x+1=0$ **2.** _____

Solve using an appropriate technique.

3. $(x-3)^2=18$ **3.** _____

4. $x^2-5x-50=0$ **4.** _____

5. $2x^2-3x-1=0$ **5.** _____

6. $4x^2-2x=-5$ **6.** _____

7. $x^3+27=0$ **7.** _____

8. $\frac{3}{x}+\frac{2}{x-1}=6$ **8.** _____

9. $\frac{x^4}{8}+\frac{x^2}{4}=3$ **9.** _____

10. $x^{\frac{2}{3}}-5x^{\frac{1}{3}}+6=0$ **10.** _____

11. $\sqrt{2x+1}=x-4$ **11.** _____

12. $3x^2-7x=2$ **12.** _____

13. $x^3-4x^2+x-4=0$ **13.** _____

Solve the inequality and write the solution in interval form.

14. $x(x-3)(x+5)>0$ **14.** _____

15. $\frac{x-2}{x+3}\geq 0$ **15.** _____

Name: **Date:**
Instructor: **Section:**

Chapter 8 Test Form B *cont'd*

16. $\dfrac{4x-2}{x-9} > 0$ **16.** _____

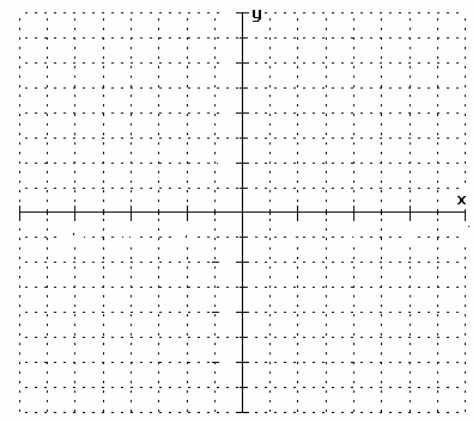
17. $-x^2 + x \geq -6$ **17.** _____

18. Find the vertex of the graph of $f(x) = -4x^2 + 12x + 7$ and determine whether the graph opens upward or downward. **18.** _____

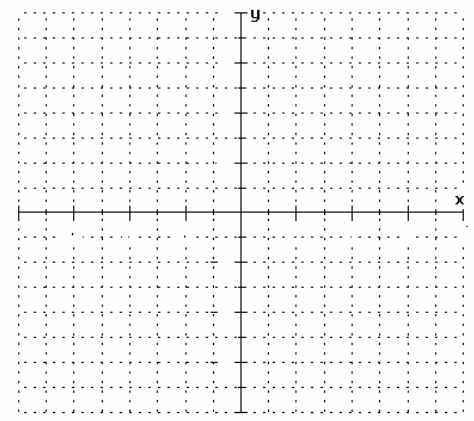
19. Find the vertex and x-intercepts of the graph $h(x) = 9x^2 - 6x - 3$. **19.** _____

Graph the parabolas. Label the vertex.

20. $f(x) = 2(x-3)^2 - 4$

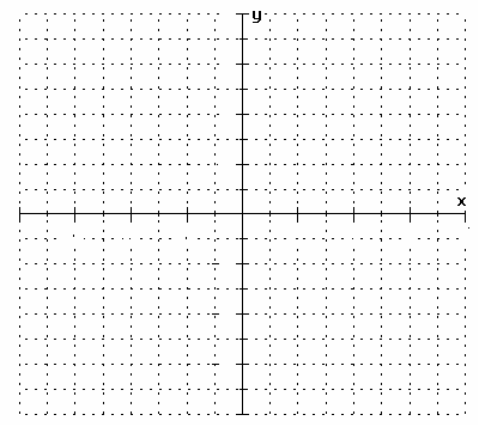


21. $y = -x^2 - 4x - 4$ Find the x-intercepts.



Chapter 8 Test Form B *cont'd*

22. Give the vertex $f(x)=\frac{1}{2}(x-1)^2+1$ and graph.



23. Use the formula $A=P(1+r)^t$ to find the r to make \$1600 grow to \$1764 in 2 years.

23. _____

24. A rectangular window needs to have an area of 6 square feet and its height must be $1\frac{1}{2}$ times its width. Find the dimensions of the window.

24. _____

25. A trailer company has found that the revenue from sales of heavy-duty truck trailers is a function of the price, p, it charges. If the revenue R is given by $R=-\frac{3}{4}p^2+2700p$, what unit price p should be charged to maximize revenue? What is the maximum revenue?

25. _____

Name: **Date:**
Instructor: **Section:**

Chapter 8 Test Form C

Solve by completing the square.

1. $x^2+6x-2=0$ **1.** _____

2. $4x^2+16x-40=0$ **2.** _____

Solve using an appropriate technique.

3. $(x+3)^2=32$ **3.** _____

4. $x^2-3x-28=0$ **4.** _____

5. $6x^2-17x=-12$ **5.** _____

6. $3x^2+6x=0$ **6.** _____

7. $2x^{\frac{2}{3}}+2x^{\frac{1}{3}}-12=0$ **7.** _____

8. $4(x^2+4)=9+12x$ **8.** _____

9. $3z^4-2z^2-5=0$ **9.** _____

10. $\frac{2}{7}x^2+\frac{12}{7}x=-\frac{54}{21}$ **10.** _____

11. $x^2+4x=12$ **11.** _____

12. $x^4-5x^2+4=0$ **12.** _____

13. $6x^2-x-12=0$ **13.** _____

Solve the inequality and write the solution in interval notation.

14. $6x(x-3)(x+5)>0$ **14.** _____

15. $\frac{x-7}{x+2}\geq 0$ **15.** _____

16. $\frac{3}{x+1}<0$ **16.** _____

Name: **Date:**
Instructor: **Section:**

Chapter 8 Test Form C *cont'd*

17. $\dfrac{x-7}{x+2} \geq 0$ **17.** _____

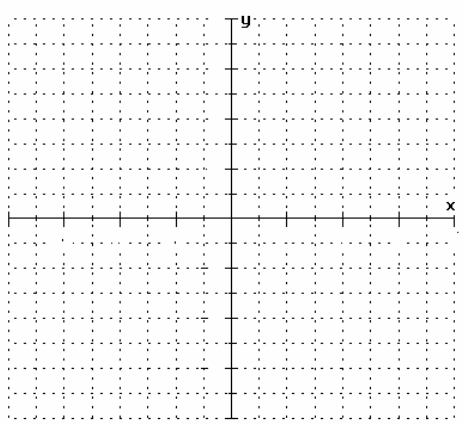
18. $\dfrac{x}{x-3} \geq 5$ **18.** _____

19. $\dfrac{z}{z-6} \leq -2z$ **19.** _____

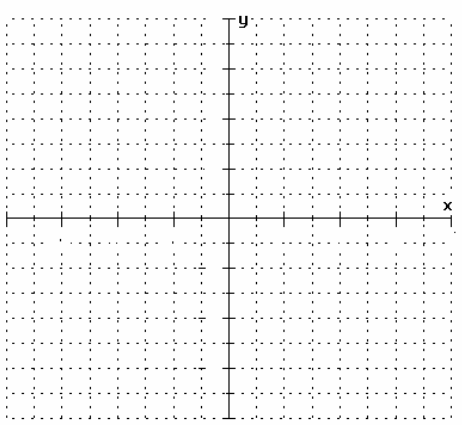
20. Find the vertex of the graph of $f(x) = 28 - 11x + x^2$. **20.** _____

Graph and find the vertex.

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



22. $f(x) = x^2 - 5x + 6$



23. Tyrone and Elias are painting a house. Together it will take them 24 hours to paint the house. Tyrone can paint the house in 6 hours less than Elias working alone. How long to the nearest hour would it take each of them working alone to paint the house? **23.** _____

24. The hypotenuse of a right triangle is 3 meters and legs are equal in length. Find the length of a leg in the triangle. **24.** _____

25. Find two positive numbers whose sum is 42 and whose product is as large as possible. **25.** _____

Name: **Date:**
Instructor: **Section:**

Chapter 8 Test Form D

Circle the correct answer.

1. The perfect square trinomial that results from completing the square in x^2+9x is

a. $x^2+9x+\frac{81}{2}$ **b.** x^2+9x+9 **c.** $x^2+9x+\frac{9}{2}$ **d.** $x^2+9x+\frac{81}{4}$

2. Solve by completing the square. $x^2+4x=6$

a. $\pm 2\sqrt{6}$ **b.** $-2\pm\sqrt{6}$ **c.** $-2\pm\sqrt{10}$ **d.** $2\pm\sqrt{6}$

3. The equation $6x^2=2x-4$ has

a. two real solutions. **b.** one real solution.
c. two complex solutions **d.** no solution

4. The equation $(x+7)(x-1)=-16$ has

a. two real solutions. **b.** one real solution.
c. two complex solutions **d.** no solution

Use the appropriate method to solve each of the following equations.

5. $(3x+6)^2=18$

a. $2-3\sqrt{2},2+3\sqrt{2}$ **b.** $-2-3\sqrt{2},-2+3\sqrt{2}$
c. $-2-\sqrt{2},-2+\sqrt{2}$ **d.** $2-\sqrt{2},2+\sqrt{2}$

6. $x^2+64=0$

a. $-8i,8i$ **b.** $-8, 8$ **c.** $-4, 4$ **d.** $-4i,4i$

7. $x^{\frac{2}{3}}-6x^{\frac{1}{3}}+8=0$

a. $2, 4$ **b.** $4, 16$ **c.** $2\sqrt{2},8$ **d.** $8, 64$

Chapter 8 Test Form D *cont'd*

8. $x^2+5x-12=0$

a. $\frac{-5-\sqrt{73}}{2},\frac{-5+\sqrt{73}}{2}$ **b.** $\frac{5-\sqrt{73}}{2},\frac{5+\sqrt{73}}{2}$

c. $\frac{-5-i\sqrt{23}}{2},\frac{-5+i\sqrt{23}}{2}$ **d.** $\frac{5-i\sqrt{23}}{2},\frac{5-i\sqrt{23}}{2}$

9. $2y^3-16=0$

a. -2 **b.** $2,-1-i\sqrt{3},-1+i\sqrt{3}$ **c.** 2 **d.** $2,-1-2i\sqrt{3},-1+2i\sqrt{3}$

10. $x^4-6x^2-7=0$

a. $-\sqrt{7},\sqrt{7},-i,i$ **b.** $-1,1,-i\sqrt{7},i\sqrt{7}$ **c.** $-i\sqrt{7},i\sqrt{7},-i,i$ **d.** $-\sqrt{7},\sqrt{7},-1,1$

11. $3x^2-2x-8=0$

a. $-\frac{2}{3},4$ **b.** $-4,\frac{2}{3}$ **c.** $-\frac{4}{3},2$ **d.** $-2,\frac{4}{3}$

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

a. $-2-2\sqrt{6},-2+2\sqrt{6}$ **b.** $-2-\sqrt{6},-2+\sqrt{6}$

c. $-2-\sqrt{3},-2+\sqrt{3}$ **d.** $-4-\sqrt{6},-4+\sqrt{6}$

13. $x^3-125=0$

a. $\frac{5-5i\sqrt{3}}{2},\frac{5+5i\sqrt{3}}{2},5$ **b.** 5 **c.** $5,-5$ **d.** $\frac{-5-5i\sqrt{3}}{2},\frac{-5+5i\sqrt{3}}{2},5$

14. $(x-3)^2+3(x-3)-18=0$

a. $-6, 1$ **b.** $-7, 4$ **c.** $-6, 3$ **d.** $-3, 6$

Chapter 8 Test Form D *cont'd*

15. $\frac{3}{x+2}-\frac{2}{x}=7$

a. $\frac{13-\sqrt{57}}{14},\frac{13+\sqrt{57}}{14}$ **b.** $\frac{57-\sqrt{13}}{14},\frac{57+\sqrt{13}}{14}$

c. $\frac{-14-\sqrt{57}}{13},\frac{-14+\sqrt{57}}{13}$ **d.** $\frac{-13-\sqrt{57}}{14},\frac{-13+\sqrt{57}}{14}$

16. If a square room has a diagonal of 38 feet, the sides of the room have length

a. 1444 feet **b.** $19\sqrt{2}$ feet **c.** $38\sqrt{2}$ feet **d.** 38 feet

17. Solve. $2x^2+2x\geq 12$

a. $[-3, 2]$ **b.** $[-2, 3]$ **c.** $(-\infty, -3] \cup [2, \infty)$ **d.** $(-\infty, -2] \cup [3, \infty)$

18. Find the equation that has the solution $(\infty, -2] \cup (0, \infty)$

a. $3x(x+2)>0$ **b.** $3x(x+2)\geq 0$ **c.** $\frac{x+2}{3x}\geq 0$ **d.** $\frac{3x}{x+2}\geq 0$

19. Solve. $3m^2+4m<-1$

a. $\left[-1,-\frac{1}{3}\right]$ **b.** $(-\infty,-1)\cup\left[-\frac{1}{3},\infty\right)$

c. $\left(-1,-\frac{1}{3}\right)$ **d.** $(-\infty,-1)\cup\left(-\frac{1}{3},\infty\right)$

20. The graph of $f(x)=-x^2-4x-7$ has its vertex at _____ and opens _____.

a. (–2, 3); downward **b.** (–2, –3); downward
c. (2, 3); upward **d.** (2, –19); downward

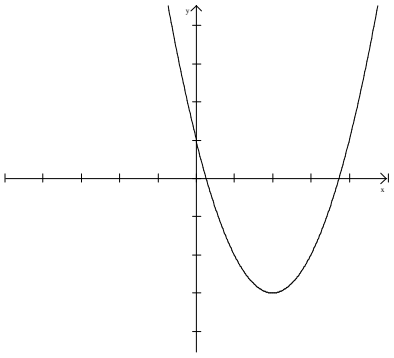
21. The axis of symmetry of the graph of $f(x)=4x^2+8x-20$ is

a. $x=-2$ **b.** $x=-1$ **c.** $x=2$ **d.** $y=1$

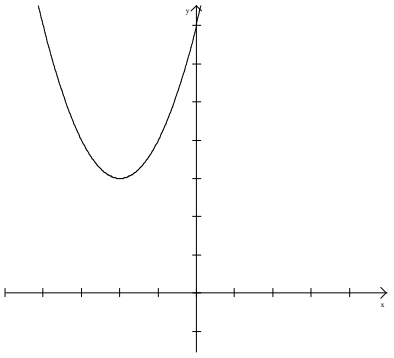
Chapter 8 Test Form D *cont'd*

22. Graph $f(x) = (x-2)^2 - 3$.

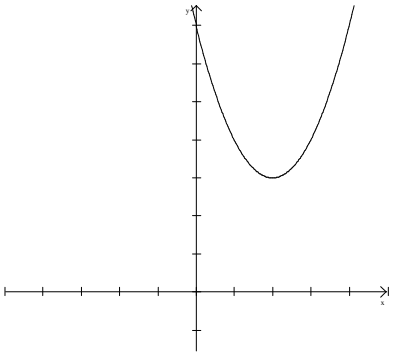
a.



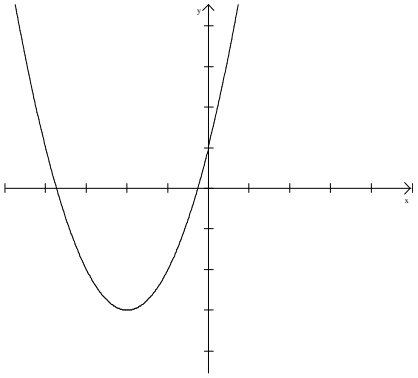
b.



c.



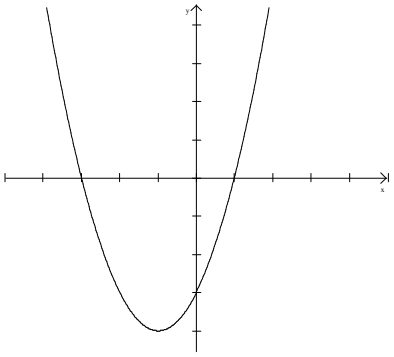
d.



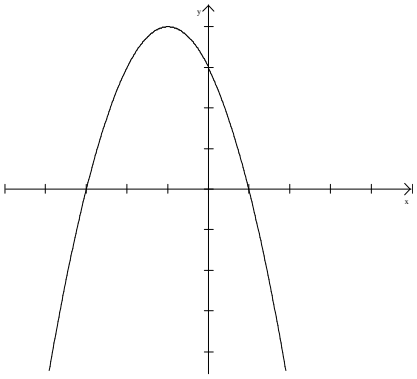
Chapter 8 Test Form D *cont'd*

23. Graph $y = -x^2 - 2x + 3$.

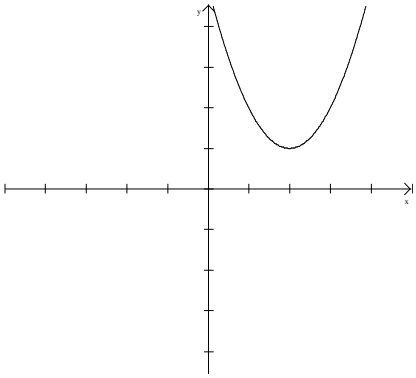
a.



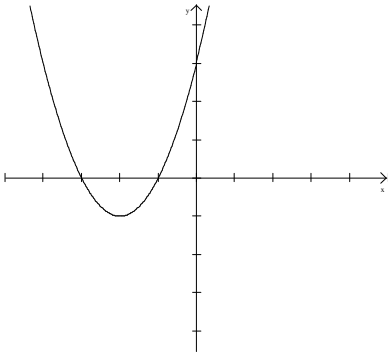
b.



c.



d.



24. The difference between the square of a negative number and five times the number is 40 more than the number. The number is

a. -5 **b.** -10 **c.** -4 **d.** -8

25. A large pipe and a small pipe can fill a tank in 6 hours. The small pipe alone takes two more hours than the large pipe alone. Find the time it would take the large pipe alone to fill the tank.

a. 1.1 hours **b.** 3.1 hours **c.** 13.1 hours **d.** 11.1 hours

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Chapter 8 Test Form E

Circle the correct answer.

1. The possible missing terms to make $x^2 + \_\_\_\_\_ + 100$ a perfect square trinomial are

a. $4x, 25x$ **b.** $-10x, 10x$ **c.** $-20x, 20x$ **d.** $-4x, -25x$

2. The perfect square trinomial that results from completing the square $x^2 - 16x$ is

a. $x^2 - 16x + 64$ **b.** $x^2 - 16x - 64$ **c.** $x^2 - 16x + 4$ **d.** $x^2 - 16x - 8$

3. The equation $5x^2 - 10x = -2$ has

a. two complex solutions **b.** one real solution
c. two real solutions **d.** no solution

4. The equation $x(x-8) = -16$ has

a. two complex solutions **b.** one real solution
c. two real solutions **d.** no solution

Solve each equation using an appropriate method.

5. $(2x-4)^2 = 32$

a. $-2-4\sqrt{2}, -2+4\sqrt{2}$ **b.** $2-4\sqrt{2}, 2+4\sqrt{2}$
c. $-2-\sqrt{2}, -2+\sqrt{2}$ **d.** $2-2\sqrt{2}, 2+2\sqrt{2}$

6. $x^2 + 25 = 0$

a. $-5i, 5i$ **b.** -5 **c.** $-5, 4$ **d.** no solution

7. $x^3 = -64$

a. -4 **b.** $-4, 2-2i\sqrt{3}, 2+2i\sqrt{3}$ **c.** $-4, -4i, 4i$ **d.** $-4, 2-4i\sqrt{3}, 2+4i\sqrt{3}$

8. $2(x+4)^2 - 5(x+4) - 12 = 0$

a. $-\frac{3}{2}, 4$ **b.** $-\frac{11}{2}, 0$ **c.** 4 **d.** 4

Chapter 8 Test Form E *cont'd*

9. $3x^2 - 12x + 20 = 0$

a. $\frac{6 - 2i\sqrt{6}}{3}, \frac{6 + 2i\sqrt{6}}{3}$ **b.** $-12 - 4i, -12 + 4i$

c. $2 - 4i\sqrt{6}, 2 + 4i\sqrt{6}$ **d.** $-2 - 4i\sqrt{6}, -2 + 4i\sqrt{6}$

10. $x^{-2} - 2x^{-1} - 8 = 0$

a. $-2, 4$ **b.** $-4, 3$ **c.** $-\frac{1}{2}, \frac{1}{4}$ **d.** no solution

11. $x^2 + x - 6 < 0$

a. $[-3,2]$ **b.** $(-\infty,-3) \cup (2,\infty)$ **c.** $(-3, 2)$ **d.** $(-2, 3)$

12. $\frac{x(x+3)}{(x-2)(x+4)} \le 0$

a. $(-4,3] \cup [0,2)$ **b.** $[-4,-3] \cup [0,2]$

c. $(-4,-3] \cup (0,2)$ **d.** $(-\infty,-4) \cup [-3,0] \cup (2,\infty)$

13. $\frac{x-5}{x+8} \ge 0$

a. $(-\infty,-5] \cup (8,\infty)$ **b.** $[-5, \infty)$ **c.** $(-\infty,-8) \cup [5,\infty)$ **d.** $(-8, 5]$

14. The equation of the parabola with the same shape as $f(x) = 9x^2$ but with the vertex at $(-3, 2)$ is

a. $f(x) = 9(x+3)^2$ **b.** $f(x) = 9(x+3)^2 + 2$

c. $f(x) = 9(x-2)^2 - 3$ **d.** $f(x) = 9(x-3)^2 + 2$

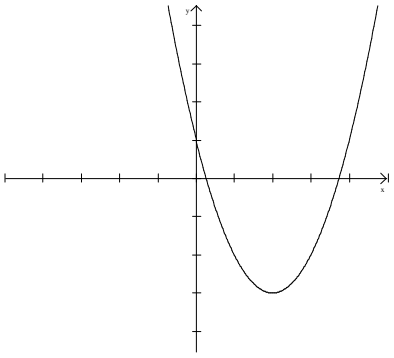
15. What is the axis of symmetry of $y = x^2 - 5x$?

a. $x = \frac{5}{2}$ **b.** $x = \frac{2}{5}$ **c.** $x = -\frac{5}{2}$ **d.** $x = -\frac{2}{5}$

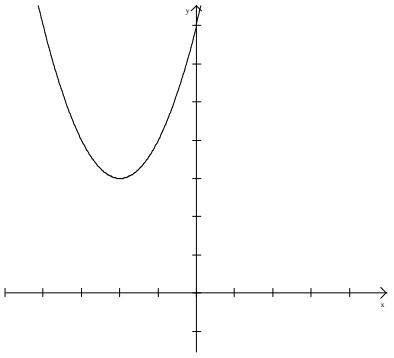
Chapter 8 Test Form E *cont'd*

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

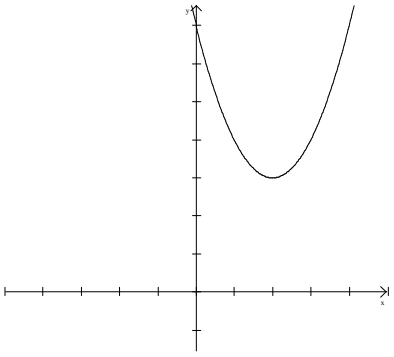
a.



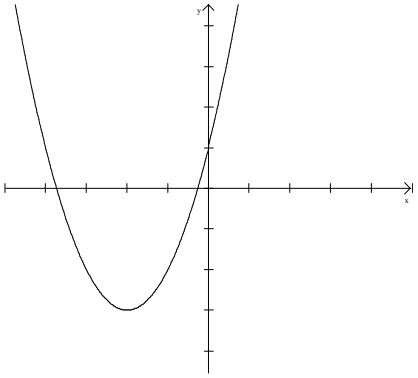
b.



c.



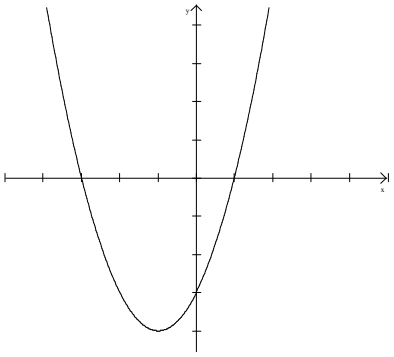
d.



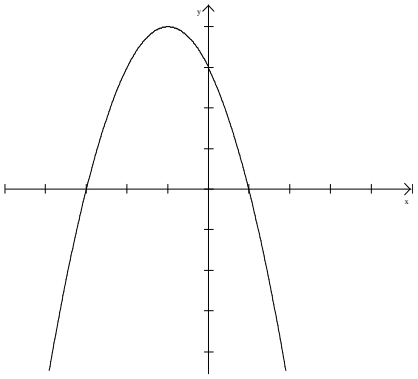
Chapter 8 Test Form E *cont'd*

17. Graph $y = x^2 + 2x - 3$.

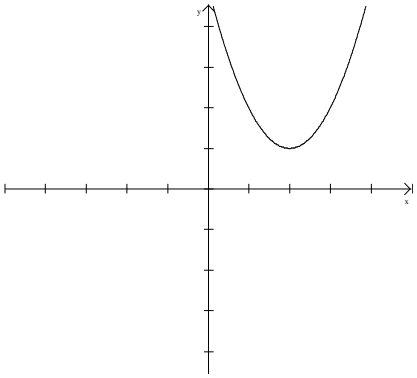
a.



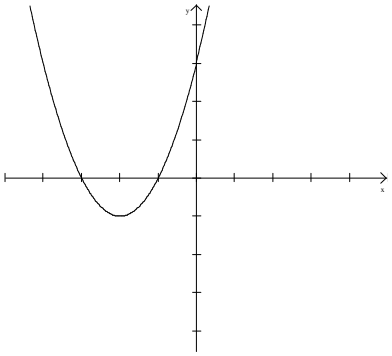
b.



c.



d.



18. The graph of $f(x) = (x-9)^2 + 16$ is a parabola with vertex _____ which opens _____.

a. (9, −16); upward **b.** (9, 16); upward
c. (9, 16); downward **d.** (9, −16); downward

19. The minimum value of $f(x) = 1.3x^2 - 6.5x + 10.35$ occurs when $x =$

a. −2.5 **b.** 2.225 **c.** 2.5 **d.** 2

20. The equation $y = -3x^2 + 4x + 1$ has a maximum value of

a. 5 **b.** $\frac{7}{3}$ **c.** $\frac{7}{12}$ **d.** $\frac{9}{2}$

Chapter 8 Test Form E *cont'd*

21. If the hypotenuse of an isosceles right triangle is 3 inches longer than either leg, find the length of the hypotenuse.

a. $3+3\sqrt{2}$ inches **b.** $6+3\sqrt{2}$ inches
c. $6-3\sqrt{2}$ inches **d.** $\frac{3}{2}$ inches

22. A rocket fired straight up from the ground with an initial velocity of 96 feet per second is at height $s(t)=-16t^2+96t$ at any time *t*. The height of the rocket is greater than 128 feet for *t* between

a. 1 and 4 seconds **b.** 2 and 4 seconds
c. 1 and 2 seconds **d.** 4 and 6 seconds

23. What is the maximum product of two numbers if their sum is 72?

a. 1260 **b.** 36 **c.** 1152 **d.** 1296

A company kept track of its sales for the 4 months of a year and found that the equation $f(x)=3.4x^2-9.1x+98$ gives the monthly sales in thousands of dollars, where *x* represents the month of the year. Use this equation for problems 24 and 25.

24. What would be the sales for the sixth month?

a. \$128,400 **b.** \$165,800 **c.** 159,600 **d.** \$173,000

25. What month would give \$242,800 in sales?

a. 10^{th} **b.** 9^{th} **c.** 5^{th} **d.** 8^{th}

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Chapter 8 Test Form F

Circle the correct answer.

1. The binomial that results from completing the square in $x^2 - 12x$ is

a. $x^2 - 12x + 144$ **b.** $x^2 - 12x + 36$ **c.** $x^2 - 12x + 6$ **d.** $x^2 - 12x + 12$

2. The possible missing terms to make $x^2 + \_\_\_ + 81$ as perfect square trinomial are

a. $-9, 9$ **b.** $-3x, 3x$ **c.** $-9x, 9x$ **d.** $-18x, 18x$

3. The equation $x^2 + 49 = 0$ has

a. two complex solutions **b.** two real solution
c. one real solutions **d.** no solution

Solve.

4. $(5x + 10)^2 = 40$

a. $\frac{-10 - 2\sqrt{10}}{5}, \frac{-10 + 2\sqrt{10}}{5}$ **b.** $-2 - 2\sqrt{2}, -2 + 2\sqrt{2}$
c. $-2 - 2\sqrt{10}, -2 + 2\sqrt{10}$ **d.** $2 - 2\sqrt{10}, 2 + 2\sqrt{10}$

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

a. $\frac{-1 - i\sqrt{19}}{2}, \frac{-1 + i\sqrt{19}}{2}$ **b.** $\frac{1 - i\sqrt{21}}{4}, \frac{1 + i\sqrt{21}}{4}$
c. $\frac{1 - i\sqrt{19}}{4}, \frac{1 + i\sqrt{19}}{4}$ **d.** no solution

6. $2x^3 - 250 = 0$

a. 5 **b.** $5, \frac{-5 - 5i\sqrt{3}}{2}, \frac{-5 + 5i\sqrt{3}}{2}$
c. -5 **d.** $5, \frac{5 - 5i\sqrt{3}}{2}, \frac{5 + 5i\sqrt{3}}{2}$

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Chapter 8 Test Form F *cont'd*

7. $x^4 - 8x^2 - 9 = 0$

a. 1, –1, 3, –3 **b.** 1, –2, 3i, –3i **c.** i, –i, 3, –3 **d.** i, –i, 3i, –3i

8. $\frac{2x}{x+4} - \frac{3}{x-2} = \frac{4}{x+4}$

a. $\frac{11-3\sqrt{17}}{4}, \frac{11+3\sqrt{17}}{4}$ **b.** $-\frac{5}{2}, 4$

c. $\frac{5-3i\sqrt{15}}{4}, \frac{5+3i\sqrt{15}}{4}$ **d.** $\frac{11-3\sqrt{17}}{2}, \frac{11+3\sqrt{17}}{2}$

9. $p^{\frac{2}{3}} + 28 = 11p^{\frac{1}{3}}$

a. $2, \sqrt{7}$ **b.** 4, 7 **c.** $8, 7\sqrt{7}$ **d.** 64, 343

10. $2x^2 + 3x - 20 = 0$

a. $-4, \frac{5}{2}$ **b.** $-\frac{5}{2}, 4$ **c.** $-4, \frac{1}{2}$ **d.** $-\frac{1}{2}, 4$

11. $(x-5)^2 - (x-5) - 12 = 0$

a. –3, 4 **b.** 2, 9 **c.** –4, 3 **d.** 1, 7

12. $2x^2 = 32$

a. $-2\sqrt{2}, -2\sqrt{2}$ **b.** $-\sqrt{8}, \sqrt{8}$ **c.** –4, 4 **d.** –2, 2

13. $x^2 - 4 < 0$

a. $(-\infty, -2) \cup (2, \infty)$ **b.** (–2, 2) **c.** $(-\infty, 2)$ **d.** $(-\infty, -2)$

14. $\frac{x-6}{x-2} \geq 0$

a. $[3, \infty)$ **b.** [2, 6] **c.** $(-\infty, 2] \cup [6, \infty)$ d. $(-\infty, 2) \cup [6, \infty)$

Chapter 8 Test Form F *cont'd*

15. The equation of the parabola that has the same shape as $f(x)=4x^2$ but opens in the opposite direction and has vertex (8, −1) is

a. $f(x)=-4(x-8)^2+1$ **b.** $f(x)=-4(x+8)^2-1$

c. $f(x)=-4(x+8)^2+1$ **d.** $f(x)=-4(x-8)^2-1$

16. The equation of the parabola that opens downward with the vertex (1, 5) is

a. $f(x)=-(x-1)^2-5$ **b.** $f(x)=(x-1)^2+5$

c. $f(x)=-(x-1)^2+5$ **d.** $f(x)=-(x+5)^2+1$

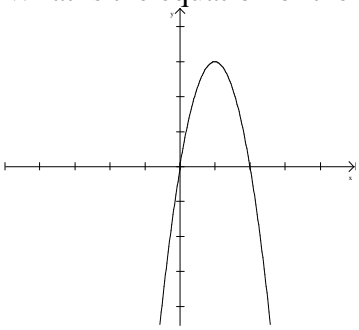
17. The axis of symmetry of the graph $f(x)=3x^2+9x+12$ is

a. $x=-\frac{9}{2}$ **b.** $x=3$ **c.** $x=\frac{9}{2}$ **d.** $x=-\frac{3}{2}$

18. The minimum value of $f(x)=x^2-34x+307$

a. 17 **b.** 307 **c.** 12 **d.** 18

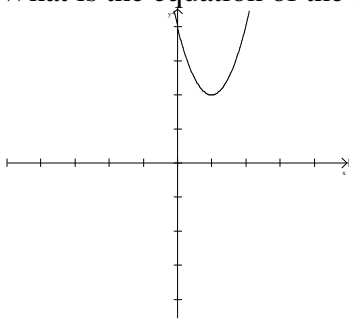
19. What is the equation of the following graph?



a. $y=-3x^2+6x$ **b.** $y=3x^2+6x$ **c.** $y=6x^2=3x$ **d.** $y=x^2+6x$

Chapter 8 Test Form F *cont'd*

20. What is the equation of the following graph?

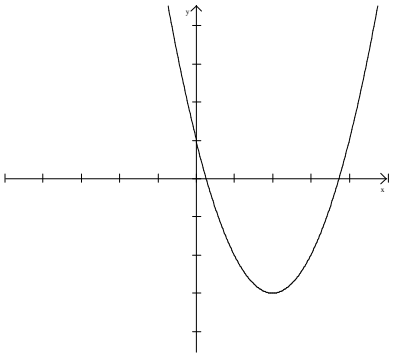


a. $f(x)=2(x-1)^2+2$ **b.** $f(x)=2(x-1)^2-2$

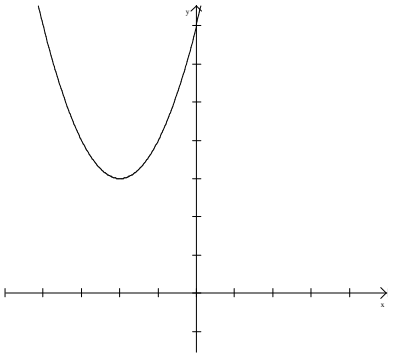
c. $f(x)=2(x+1)^2-2$ **d.** $f(x)=2(x+1)^2+2$

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

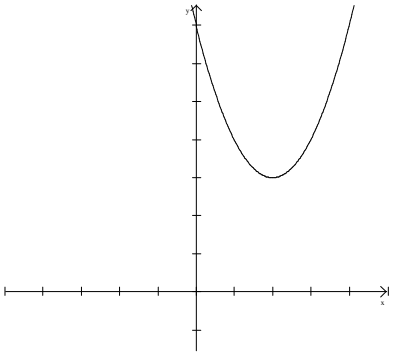
a.



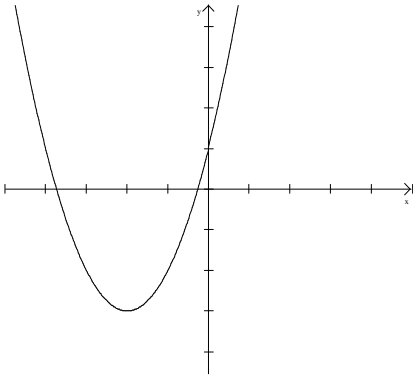
b.



c.



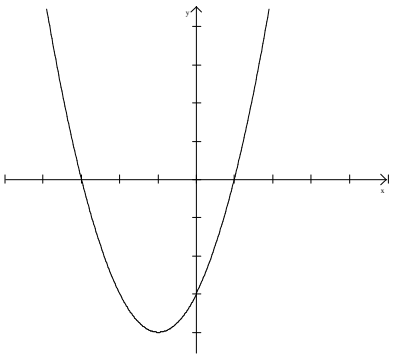
d.



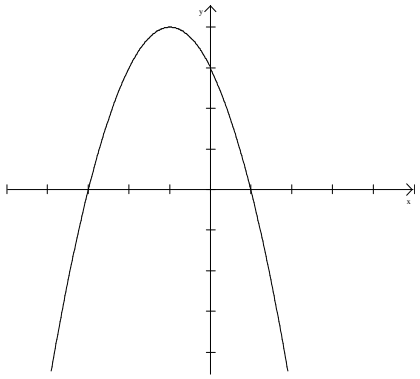
Chapter 8 Test Form F *cont'd*

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

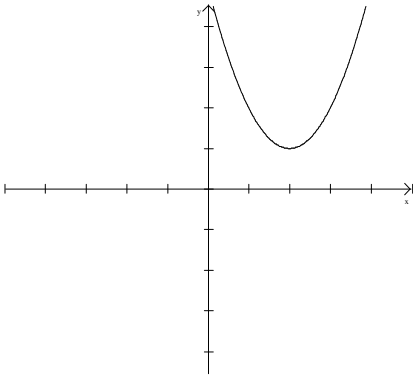
a.



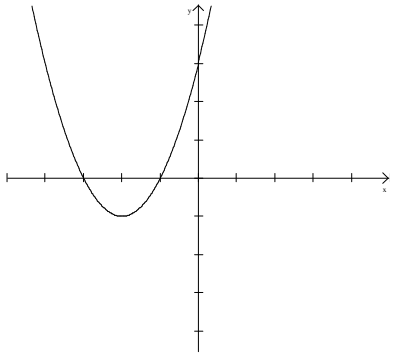
b.



c.



d.



23. A rectangle is 4 times a long as it is wide. If the length of the diagonal is 51 centimeters, the length of the rectangle is

a. $3\sqrt{17}$ cm **b.** $12\sqrt{17}$ cm **c.** 17 cm **d.** 3 cm

24. The diagonal of a square is 6 meters more than one of its sides. What is the length of a side in meters?

a. $3\sqrt{2}-3$ m **b.** $6\sqrt{2}-6$ m **c.** $3+3\sqrt{2}$ m **d.** $6+6\sqrt{2}$ m

25. George and Cindy together can stock the shelves of the local market in 5 hours. When she works alone, it takes Cindy 1 hour longer to stock than it takes George working alone. About how long does it take George to stock the shelves?

a. 9.52 hrs **b.** 11.54 hrs **c.** 10.52 hrs **d.** 10.54 hrs