

**Practice 10-1****Exploring Quadratic Graphs**

Identify the vertex of each graph. Tell whether it is a minimum or a maximum.

1.  $y = -3x^2$

2.  $y = -7x^2$

3.  $y = 0.5x^2$

4.  $y = 5x^2$

5.  $y = -4x^2$

6.  $y = \frac{3}{2}x^2$

Order each group of quadratic functions from widest to narrowest graph.

7.  $y = x^2, y = 5x^2, y = 3x^2$

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

9.  $y = 5x^2, y = -4x^2, y = 2x^2$

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

11.  $y = 6x^2, y = -7x^2, y = 4x^2$

12.  $y = \frac{3}{4}x^2, y = 2x^2, y = \frac{1}{5}x^2$

Graph each function.

13.  $y = x^2$

14.  $y = 4x^2$

15.  $y = -3x^2$

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

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

18.  $y = 2x^2 + 3$

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

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

21.  $y = \frac{1}{3}x^2 + 5$

22.  $y = \frac{1}{3}x^2 - 4$

23.  $y = 2.5x^2 + 3$

24.  $y = 2.5x^2 + 5$

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

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

27.  $y = -3.5x^2 - 4$

28. The price of a stock on the NYSE is modeled by the function  $y = 0.005x^2 + 10$ , where  $x$  is the number of months the stock has been available.

- Graph the function.
- What  $x$ -values make sense for the domain? Explain why.
- What  $y$ -values make sense for the range? Explain why.

29. You are designing a poster. The poster is 24 in. wide by 36 in. high. On the poster, you want to place a square photograph and some printing. If each side of the photograph is  $x$  in., the function  $y = 864 - x^2$  gives the area of the poster available for printing.

- Graph the function.
- What  $x$ -values make sense for the domain? Explain why.
- What  $y$ -values make sense for the range? Explain why.

30. You are placing a circular drawing on a square piece of poster board. The poster board is 15 in. wide. The part of the poster board not covered by the drawing will be painted blue. If the radius of the drawing is  $r$ , the function  $A = 225 - 3.14r^2$  gives the area to be painted blue.

- Graph the function.
- What  $x$ -values make sense for the domain? Explain why.
- What  $y$ -values make sense for the range? Explain why.

**Practice 10-2****Quadratic Functions**

Find the equation of the axis of symmetry and the coordinates of the vertex of the graph of each function.

1.  $y = x^2 - 10x + 2$

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

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

4.  $y = 3x^2 + 18x + 9$

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

6.  $y = 16x - 4x^2$

7.  $y = 0.5x^2 + 4x - 2$

8.  $y = -4x^2 + 24x + 6$

9.  $y = -1.5x^2 + 6x$

Graph each function. Label the axis of symmetry, the vertex, and the  $y$ -intercept.

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

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

12.  $y = x^2 + 10x + 14$

13.  $y = x^2 + 2x + 1$

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

15.  $y = -4x^2 + 24x + 13$

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

17.  $y = 4x^2 - 16x + 10$

18.  $y = -x^2 + 6x + 5$

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

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

21.  $y = 6x^2 + 48x + 98$

Graph each quadratic inequality.

22.  $y > x^2 + 1$

23.  $y \geq x^2 - 4$

24.  $y < -x^2 + 1$

25.  $y > x^2 + 6x + 3$

26.  $y < x^2 - 4x + 4$

27.  $y < -x^2 + 2x - 3$

28.  $y \geq -2x^2 - 8x - 5$

29.  $y \leq -3x^2 + 6x + 1$

30.  $y \geq 2x^2 - 4x - 3$

Find the vertex of each function. Determine whether the vertex is a maximum or minimum.

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

32.  $y = -2x^2 - 16x - 33$

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

34.  $y = -3.5x^2 - 14x - 10$

35.  $y = 0.05x^2 - 3.2x + 4$

36.  $y = -1.8x^2 + 16.2x - 18.2$

37. You and a friend are hiking in the mountains. You want to climb to a ledge that is 20 ft above you. The height of the grappling hook you throw is given by the function  $h = -16t^2 - 32t + 5$ . What is the maximum height of the grappling hook? Can you throw it high enough to reach the ledge?

38. The total profit made by an engineering firm is given by the function  $p = x^2 - 25x + 5000$ . Find the minimum profit made by the company.

39. You are trying to dunk a basketball. You need to jump 2.5 ft in the air to dunk the ball. The height that your feet are above the ground is given by the function  $h = -16t^2 + 12t$ . What is the maximum height your feet will be above the ground? Will you be able to dunk the basketball?

**Practice 10-3**

## Finding and Estimating Square Roots

Tell whether each expression is *rational* or *irrational*.

- |                 |                  |                    |                   |
|-----------------|------------------|--------------------|-------------------|
| 1. $-\sqrt{64}$ | 2. $\sqrt{1600}$ | 3. $\pm\sqrt{160}$ | 4. $\sqrt{144}$   |
| 5. $\sqrt{125}$ | 6. $-\sqrt{340}$ | 7. $\sqrt{1.96}$   | 8. $-\sqrt{0.09}$ |

Use a calculator to find each square root to the nearest hundredth.

- |                    |                     |                      |                     |
|--------------------|---------------------|----------------------|---------------------|
| 9. $\sqrt{20}$     | 10. $\sqrt{73}$     | 11. $-\sqrt{38}$     | 12. $\sqrt{130}$    |
| 13. $\sqrt{149.3}$ | 14. $-\sqrt{8.7}$   | 15. $\sqrt{213.8}$   | 16. $-\sqrt{320.7}$ |
| 17. $\sqrt{113.9}$ | 18. $-\sqrt{840.6}$ | 19. $-\sqrt{1348.9}$ | 20. $\sqrt{928.2}$  |

Simplify each expression.

- |                   |                               |                           |                                |
|-------------------|-------------------------------|---------------------------|--------------------------------|
| 21. $\sqrt{49}$   | 22. $-\sqrt{2.25}$            | 23. $\sqrt{\frac{1}{16}}$ | 24. $\sqrt{400}$               |
| 25. $\sqrt{6.25}$ | 26. $\pm\sqrt{\frac{36}{25}}$ | 27. $\sqrt{196}$          | 28. $\sqrt{2.56}$              |
| 29. $\sqrt{0.25}$ | 30. $\pm\sqrt{\frac{9}{100}}$ | 31. $\sqrt{576}$          | 32. $\pm\sqrt{\frac{121}{36}}$ |
| 33. $\sqrt{1600}$ | 34. $-\sqrt{0.04}$            | 35. $\sqrt{2500}$         | 36. $\sqrt{4.41}$              |

Between what two consecutive integers is each square root?

- |                     |                     |                     |                    |
|---------------------|---------------------|---------------------|--------------------|
| 37. $\sqrt{40}$     | 38. $\sqrt{139}$    | 39. $-\sqrt{75}$    | 40. $\sqrt{93}$    |
| 41. $-\sqrt{105.6}$ | 42. $-\sqrt{173.2}$ | 43. $\sqrt{1123.7}$ | 44. $\sqrt{216.9}$ |

Solve the following problems. Round to the nearest tenth if necessary.

45. You are to put a metal brace inside a square shipping container. The formula  $d = \sqrt{2x^2}$  gives the length of the metal brace, where  $x$  is the length of the side of the container. Find the length of the brace for each container side length.
- |               |                 |               |               |
|---------------|-----------------|---------------|---------------|
| a. $x = 3$ ft | b. $x = 4.5$ ft | c. $x = 5$ ft | d. $x = 8$ ft |
|---------------|-----------------|---------------|---------------|
46. You are designing a cone-shaped storage container. Use the formula  $r = \sqrt{\frac{3V}{\pi h}}$  to find the radius of the storage container. Find the radius when  $V = 10,000$  ft<sup>3</sup> and  $h = 10$  ft.

# Practice 10-4

## Solving Quadratic Equations

Solve each equation by finding square roots. If the equation has no real solution, write *no solution*. If the value is irrational, round to the nearest hundredth.

- |                       |                          |                       |
|-----------------------|--------------------------|-----------------------|
| 1. $x^2 = 16$         | 2. $x^2 - 144 = 0$       | 3. $3x^2 - 27 = 0$    |
| 4. $x^2 + 16 = 0$     | 5. $x^2 = 12$            | 6. $x^2 = 49$         |
| 7. $x^2 + 8 = -10$    | 8. $3x^2 = 300$          | 9. $2x^2 - 6 = 26$    |
| 10. $x^2 = 80$        | 11. $81x^2 - 10 = 15$    | 12. $2x^2 = 90$       |
| 13. $x^2 = 300$       | 14. $4x^2 + 9 = 41$      | 15. $2x^2 + 8 = 4$    |
| 16. $x^2 + 8 = 72$    | 17. $4x^2 + 6 = 7$       | 18. $x^2 = 121$       |
| 19. $5x^2 + 20 = 30$  | 20. $x^2 + 6 = 17$       | 21. $3x^2 + 1 = 54$   |
| 22. $2x^2 - 7 = 74$   | 23. $x^2 + 1 = 0$        | 24. $4x^2 - 8 = -20$  |
| 25. $9x^2 = 1$        | 26. $x^2 + 4 = 4$        | 27. $3x^2 = 1875$     |
| 28. $x^2 = 9$         | 29. $5x^2 - 980 = 0$     | 30. $x^2 - 10 = 100$  |
| 31. $4x^2 - 2 = 1$    | 32. $3x^2 - 75 = 0$      | 33. $x^2 + 25 = 0$    |
| 34. $2x^2 - 10 = -4$  | 35. $4x^2 + 3 = 3$       | 36. $4x^2 - 8 = 32$   |
| 37. $7x^2 + 8 = 15$   | 38. $x^2 + 1 = 26$       | 39. $6x^2 = -3$       |
| 40. $x^2 - 400 = 0$   | 41. $7x^2 - 8 = 20$      | 42. $2x^2 - 1400 = 0$ |
| 43. $5x^2 + 25 = 90$  | 44. $x^2 + 4x^2 = 20$    | 45. $5x^2 - 18 = -23$ |
| 46. $3x^2 - x^2 = 10$ | 47. $2x^2 + 6 - x^2 = 9$ | 48. $x^2 - 225 = 0$   |
| 49. $-3 + 4x^2 = 2$   | 50. $7x^2 - 1008 = 0$    | 51. $6x^2 - 6 = 12$   |

Solve each problem. If necessary, round to the nearest tenth.

52. You want to build a fence around a square garden that covers  $506.25 \text{ ft}^2$ . How many feet of fence will you need to complete the job?
53. The formula  $A = 6s^2$  will calculate the surface area of a cube. Suppose you have a cube that has a surface area of  $216 \text{ in.}^2$ . What is the length of each side?
54. You drop a pencil out of a window that is 20 ft above the ground. Use the formula  $V^2 = 64s$ , where  $V$  is the speed and  $s$  is the distance fallen, to calculate the speed the pencil is traveling when it hits the ground.
55. Suppose you are going to construct a circular fish pond in your garden. You want the pond to cover an area of  $300 \text{ ft}^2$ . What is the radius of the pond?
56. During the construction of a skyscraper, a bolt fell from 400 ft. What was the speed of the bolt when it hit the ground? Use  $V^2 = 64s$ .

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**Practice 10-5****Factoring to Solve Quadratic Equations**

Use the Zero-Product Property to solve each equation.

1.  $(x + 5)(x - 3) = 0$

2.  $(x - 2)(x + 9) = 0$

3.  $(b - 12)(b + 12) = 0$

4.  $(2n + 3)(n - 4) = 0$

5.  $(x + 7)(4x - 5) = 0$

6.  $(2x + 7)(2x - 7) = 0$

7.  $(3x - 7)(2x + 1) = 0$

8.  $(8y - 3)(4y + 1) = 0$

9.  $(5x + 6)(4x + 5) = 0$

Solve by factoring.

10.  $x^2 + 5x + 6 = 0$

11.  $b^2 - 7b - 18 = 0$

12.  $r^2 - 4 = 0$

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

14.  $y^2 + 14y + 13 = 0$

15.  $s^2 - 3s - 10 = 0$

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

17.  $x^2 = 25$

18.  $h^2 + 10h = -21$

19.  $2t^2 + 8t - 64 = 0$

20.  $3a^2 - 36a + 81 = 0$

21.  $5x^2 - 45 = 0$

22.  $2a^2 - a - 21 = 0$

23.  $3n^2 - 11n + 10 = 0$

24.  $2x^2 - 7x - 9 = 0$

25.  $2n^2 - 5n = 12$

26.  $3m^2 - 5m = -2$

27.  $5s^2 - 17s = -6$

28.  $6m^2 = 13m + 28$

29.  $4a^2 - 4a = 15$

30.  $4r^2 = r + 3$

31. Suppose you are building a storage box of volume  $4368 \text{ in.}^3$ . The length of the box will be 24 in. The height of the box will be 1 in. more than its width. Find the height and width of the box.
32. A banner is in the shape of a right triangle of area  $63 \text{ in.}^2$ . The height of the banner is 4 in. less than twice the width of the banner. Find the height and width of the banner.
33. A rectangular poster has an area of  $190 \text{ in.}^2$ . The height of the poster is 1 in. less than twice its width. Find the dimensions of the poster.
34. A diver is standing on a platform 24 ft above the pool. He jumps from the platform with an initial upward velocity of 8 ft/s. Use the formula  $h = -16t^2 + vt + s$ , where  $h$  is his height above the water,  $t$  is the time,  $v$  is his starting upward velocity, and  $s$  is his starting height. How long will it take for him to hit the water?

Solve each equation.

35.  $(x - 9)(x + 8) = 0$

36.  $x^2 - 9x - 10 = 0$

37.  $(c - 21)(c + 21) = 0$

38.  $(x - 12)(5x - 13) = 0$

39.  $2a^2 - 21a - 65 = 0$

40.  $x^2 + 6x - 91 = 0$

41.  $a^2 + 6a - 72 = 0$

42.  $4x^2 + 8x - 21 = 0$

43.  $20d^2 - 82d + 80 = 0$

44.  $3n^2 + 12n - 288 = 0$

45.  $2s^2 - 13s - 24 = 0$

46.  $x^2 + 5x = 150$

47.  $3c^2 + 8c = 3$

48.  $30a^2 + 121a - 21 = 0$

49.  $c^2 - 81 = 0$

50.  $x^2 + 306 = -35x$

51.  $x^2 = 121$

52.  $x^2 - 21x + 108 = 0$

**Practice 10-6****Completing the Square**

Find the value of  $c$  such that each expression is a perfect square trinomial.

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

2.  $x^2 - \frac{2}{9}x + c$

3.  $x^2 - \frac{4}{9}x + c$

4.  $x^2 - \frac{2}{6}x + c$

Solve each equation by completing the square.

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

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

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

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

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

10.  $x^2 - 8x - 4 = 0$

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

12.  $x^2 - 6x = 8$

13.  $x^2 - 7x = 0$

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

15.  $x^2 + 11x + 10 = 0$

16.  $x^2 + 2x = 15$

17.  $x^2 - 8x = 9$

18.  $x^2 + 5x = -6$

19.  $x^2 - 2x = 120$

20.  $x^2 - 22x = -105$

21.  $2x^2 = 3x + 9$

22.  $2x^2 + 8x - 10 = 0$

23.  $2x^2 - 3x - 2 = 0$

24.  $2x^2 + 12x - 32 = 0$

25.  $3x^2 + 17x - 6 = 0$

26.  $2x^2 - x - 28 = 0$

27.  $3x^2 - 4x + 1 = 0$

28.  $2x^2 - 5x - 3 = 0$

29.  $6x^2 - 2x = 28$

30.  $2x^2 - 16x = -30$

31.  $4x^2 = -2x + 12$

32.  $9x^2 + 6x = 3$

33.  $10x^2 + 3x = 4$

34.  $12x^2 - 29x + 15 = 0$

**Practice 10-7**

Using the Quadratic Formula

Use the quadratic formula to solve each equation. If the equation has no real solutions write *no real solutions*. If necessary, round your answers to the nearest hundredth.

1.  $x^2 + 8x + 5 = 0$
  2.  $x^2 - 36 = 0$
  3.  $d^2 - 4d - 96 = 0$
  4.  $a^2 - 3a - 154 = 0$
  5.  $4p^2 - 12p - 91 = 0$
  6.  $5m^2 + 9m = 126$
  7.  $r^2 - 35r + 70 = 0$
  8.  $y^2 + 6y - 247 = 0$
  9.  $x^2 + 12x - 40 = 0$
  10.  $4n^2 - 81 = 0$
  11.  $x^2 + 13x + 30 = 0$
  12.  $a^2 - a = 132$
  13.  $6w^2 - 23w + 7 = 0$
  14.  $4x^2 + 33x = 27$
  15.  $7s^2 - 7 = 0$
  16.  $x^2 + 5x - 90 = 0$
  17.  $5b^2 - 20 = 0$
  18.  $4x^2 - 3x + 6 = 0$
  19.  $6h^2 + 77h - 13 = 0$
  20.  $5y^2 = 17y + 12$
  21.  $g^2 - 15g = 54$
  22.  $27f^2 = 12$
  23.  $4x^2 - 52x + 133 = 0$
  24.  $x^2 + 36x + 60 = 0$
  25.  $a^2 - 2a - 360 = 0$
  26.  $x^2 + 10x + 40 = 0$
  27.  $t^2 - 10t = 39$
  28.  $4x^2 + 7x - 9 = 0$
  29.  $2c^2 - 39c + 135 = 0$
  30.  $4x^2 + 33x + 340 = 0$
  31.  $m^2 - 40m + 100 = 0$
  32.  $8x^2 + 25x + 19 = 0$
  33.  $36w^2 - 289 = 0$
  34.  $4d^2 + 29d - 60 = 0$
  35.  $4z^2 + 43z + 108 = 0$
  36.  $3x^2 - 19x + 40 = 0$
  37.  $14x^2 = 56$
  38.  $32x^2 - 18 = 0$
  39.  $r^2 + r - 650 = 0$
  40.  $2y^2 = 39y - 17$
  41.  $5a^2 - 9a + 5 = 0$
  42.  $x^2 = 9x + 120$
  43.  $8h^2 - 38h + 9 = 0$
  44.  $20x^2 = 245$
  45.  $9h^2 - 72h = -119$
  46.  $x^2 + 3x + 8 = 0$
  47.  $6m^2 - 13m = 19$
  48.  $9x^2 - 81 = 0$
  49.  $4s^2 + 8s = 221$
  50.  $6p^2 + 25p - 119 = 0$
  51.  $2s^2 - 59s + 17 = 0$
52. A rectangular painting has dimensions  $x$  and  $x + 10$ . The painting is in a frame 2 in. wide. The total area of the picture and the frame is  $900 \text{ in.}^2$ . What are the dimensions of the painting?
53. A ball is thrown upward from a height of 15 ft with an initial upward velocity of 5 ft/s. Use the formula  $h = -16t^2 + vt + s$  to find how long it will take for the ball to hit the ground.
54. Your community wants to put a square fountain in a park. Around the fountain will be a sidewalk that is 3.5 ft wide. The total area that the fountain and sidewalk can be is  $700 \text{ ft}^2$ . What are the dimensions of the fountain?
55. The Garys have a triangular pennant of area  $420 \text{ in.}^2$  flying from the flagpole in their yard. The height of the triangle is 10 in. less than 5 times the base of the triangle. What are the dimensions of the pennant?

**Practice 10-8**

Using the Discriminant

Find the number of real solutions of each equation.

1.  $x^2 + 6x + 10 = 0$

2.  $x^2 - 4x - 1 = 0$

3.  $x^2 + 6x + 9 = 0$

4.  $x^2 - 8x + 15 = 0$

5.  $x^2 - 5x + 7 = 0$

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

7.  $3x^2 - 18x + 27 = 0$

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

9.  $-5x^2 - 10x = 0$

10.  $-x^2 = 4x + 6$

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

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

13.  $7x^2 + 16x + 11 = 0$

14.  $12x^2 - 11x - 2 = 0$

15.  $-9x^2 - 25x + 20 = 0$

16.  $16x^2 + 8x = -1$

17.  $-16x^2 + 11x = 11$

18.  $12x^2 - 12x = -3$

19.  $0.2x^2 + 4.5x - 2.8 = 0$

20.  $-2.8x^2 + 3.1x = -0.5$

21.  $0.5x^2 + 0.6x = 0$

22.  $1.5x^2 - 15x + 2.5 = 0$

23.  $-3x^2 + 27x = -40$

24.  $2.1x^2 + 4.2 = 0$

25. One of the games at a carnival involves trying to ring a bell with a ball by hitting a lever that propels the ball into the air. The height of the ball is modeled by the equation  $h = -16t^2 + 39t$ . If the bell is 25 ft above the ground, will it be hit by the ball?

26. You are placing a rectangular picture on a square poster board. You can enlarge the picture to any size. The area of the poster board not covered by the picture is modeled by the equation  $A = -x^2 - 10x + 300$ . Is it possible for the area not covered by the picture to be 100 in.<sup>2</sup>?

27. The equation  $h = -16t^2 + 58t + 3$  models the height of a baseball  $t$  seconds after it has been hit.

a. Was the height of the baseball ever 40 ft?

b. Was the height of the baseball ever 60 ft?

28. A firefighter is on the fifth floor of an office building. She needs to throw a rope into the window above her on the seventh floor. The function  $h = -16t^2 + 36t$  models how high above her she is able to throw a rope. If she needs to throw the rope 40 ft above her to reach the seventh-floor window, will the rope get to the window?

Find the number of  $x$ -intercepts of each function.

29.  $y = x^2 + 10x + 16$

30.  $y = x^2 + 3x + 5$

31.  $y = x^2 - 2x - 7$

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

33.  $y = 2x^2 + x$

34.  $y = 3x^2 + 2x + 1$

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

36.  $y = x^2 - 16x + 64$

37.  $y = -2x^2 - 5x - 6$

38.  $y = -4x^2 - 5x - 2$

39.  $y = -x^2 + 12x - 36$

40.  $y = -5x^2 + 11x - 6$



# Practice 10-9

## Choosing a Linear, Quadratic, or Exponential Model

Which kind of function best models the data? Write an equation to model the data.

1.  $(-1, 3), (1, 3), (3, 27), (5, 75), (7, 147)$

2.  $(-2, 4), (-1, 2), (0, 0), (1, -2), (2, -4)$

3.  $(-2, \frac{1}{16}), (-1, \frac{1}{4}), (0, 1), (1, 4), (2, 16)$

4.  $(-6, -1), (-3, 0), (0, 1), (3, 2), (6, 3)$

5.  $(-2, \frac{1}{3}), (-1, 1), (0, 3), (1, 9), (2, 27)$

6.  $(-4, -32), (-2, -8), (0, 0), (2, -8), (4, -32)$

7.

x	y
-3	$\frac{9}{2}$
-2	2
-1	$\frac{1}{2}$
0	0

8.

x	y
-1	-2
0	-4
1	-6
2	-8

9.

x	y
-4	-4
-2	-1
0	0
2	-1

10.

x	y
0	-2
1	-8
2	-32
3	-128

11.

x	y
-7	-245
-5	-125
-3	-45
-1	-5

12.

x	y
-2	$\frac{3}{2}$
0	$\frac{1}{2}$
2	$-\frac{1}{2}$
4	$-\frac{3}{2}$

13.  $(-2, \frac{1}{3}), (-1, \frac{1}{3}), (0, \frac{1}{3}), (1, \frac{1}{3}), (2, \frac{1}{3})$

14.  $(-1, -\frac{1}{4}), (0, -\frac{1}{2}), (1, -1), (2, -2), (3, -4)$

15. The cost of shipping computers from a warehouse is given in the table below.

<b>Number of Computers</b>	50	75	100	125
<b>Cost (dollars)</b>	1700	2500	3300	4100

- Determine which kind of function best models the data.
- Write an equation to model the data.
- On the basis of your equation, what is the cost of shipping 27 computers?
- On the basis of your equation, how many computers could be shipped for \$5500?

16. During a scientific experiment, the bacteria count was taken at 5-min intervals. The data shows the count at several time periods during the experiment.

<b>Time Interval</b>	0	1	2	3
<b>Count</b>	110	132	159	190

- Determine which kind of function best models the data.
- Write an equation to model the data.
- On the basis of your equation, what is the count 1 hr, 45 min after the start of the experiment?

# Reteaching 10-1

## Exploring Quadratic Graphs

**OBJECTIVE:** Graphing quadratic functions of the form  $y = ax^2 + c$

**MATERIALS:** Graph paper

$y = ax^2$	Comparison	$y = ax^2 + c$
It forms a parabola.	Same	It forms a parabola.
It opens up if $a > 0$ .	Same	It opens up if $a > 0$ .
It opens down if $a < 0$ .	Same	It opens down if $a < 0$ .
Its line of symmetry is the $y$ -axis.	Same	Its line of symmetry is the $y$ -axis.
The vertex is the origin	Different	The vertex is shifted up $c$ units from the origin if $c > 0$ , down $c$ units if $c < 0$ .

### Example

Sketch the graph of the equation  $y = -x^2 + 5$ .

Gather some information about the graph by looking closely at the equation.

opens *downward*

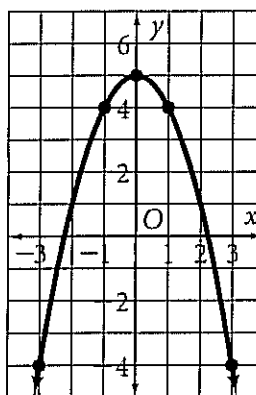
$$y = -x^2 + 5$$

The vertex is shifted *up* five units from the origin.

Make a table of values

$x$	$y$
-3	-4
-1	4
0	5
1	4
3	-4

Graph.



### Exercises

Fill in the blanks for each equation. Make a table of values. Then graph each equation.

The parabola opens \_\_\_\_\_.

The vertex is shifted \_\_\_\_\_ unit(s) from the origin.

- |                              |                              |
|------------------------------|------------------------------|
| 1. $y = x^2$                 | 2. $y = 3x^2 + 1$            |
| 3. $y = -4x^2$               | 4. $y = \frac{1}{2}x^2$      |
| 5. $y = -\frac{1}{2}x^2 - 3$ | 6. $y = x^2 + \frac{1}{2}$   |
| 7. $y = 2x^2 - 4$            | 8. $y = -x^2 - 3$            |
| 9. $y = -4x^2 + 7$           | 10. $y = \frac{1}{4}x^2 - 2$ |

# Reteaching 10-2

## Quadratic Functions

**OBJECTIVE:** Graphing quadratic functions of the form  $y = ax^2 + bx + c$

**MATERIALS:** Graph paper

To graph the quadratic function  $y = ax^2 + bx + c$ :

- Find the axis of symmetry by substituting  $a$  and  $b$  values into the equation  $x = -\frac{b}{2a}$ . This is also the  $x$ -coordinate of the vertex.
- Find the  $y$ -coordinate of the vertex by substituting the  $x$ -value into the quadratic equation and solving for  $y$ .
- For graphs of inequalities, the curve is dashed for  $<$  or  $>$  and solid for  $\leq$  or  $\geq$ .

### Example

Sketch the graph of the equation  $f(x) = -3 - 2x + x^2$ .

Standard form:  $y = x^2 - 2x - 3$

Axis of symmetry:  $y = -\frac{b}{2a} = -\frac{(-2)}{2(1)} = \frac{2}{2(1)} = 1$

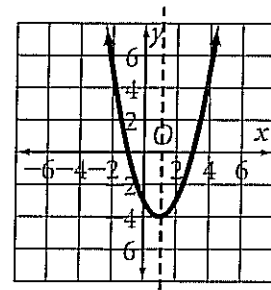
Vertex: Substitute  $x = 1$  into the equation to get  $y$ .

$$y = (1)^2 - 2(1) - 3 = -4$$

vertex:  $(1, -4)$

Table of Values		
$x$	$x^2 - 2x - 3$	$y$
-2	$4 + 4 - 3$	5
0	$0 - 0 - 3$	-3
2	$4 - 4 - 3$	-3

←  $y$ -intercept



### Exercises

Find the following to graph  $y + x^2 = 16 + 4x$ .

1. Standard form:
2. Axis of symmetry:
3. Vertex:
4. Table of values
5. Graph

Graph each function.

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

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

# Reteaching 10-3

## Finding and Estimating Square Roots



<b>OBJECTIVE:</b> Finding square roots	<b>MATERIALS:</b> Calculator
--	------------------------------

- In decimal form, a rational number terminates or repeats.
- In decimal form, an irrational number continues without repeating.

### Example

Complete the following table involving square roots.

Number	Principal Square Root	Negative Square Root	Rational/Irrational	Perfect Square or $\sqrt{\quad}$ Between Which Consecutive Integers
81	9	-9	rational	perfect square
0.25	0.5	-0.5	rational	perfect square
$\frac{4}{9}$	$\frac{2}{3}$	$-\frac{2}{3}$	rational	perfect square
7	2.645 ...	-2.645 ...	irrational	between 2 and 3
-17	undefined	undefined	undefined	undefined

### Exercises

Complete the following table involving square roots.

1.

Number	Principal Square Root	Negative Square Root	Rational/Irrational	Perfect Square or $\sqrt{\quad}$ Between Which Consecutive Integers
$\frac{1}{64}$				
26				
23				
-36				
$\frac{81}{324}$				

Simplify each expression, and label it as rational or irrational.

- |                 |                |                         |
|-----------------|----------------|-------------------------|
| 2. $\sqrt{100}$ | 3. $\sqrt{12}$ | 4. $\sqrt{-14}$         |
| 5. $\sqrt{63}$  | 6. $-\sqrt{0}$ | 7. $\sqrt{\frac{1}{9}}$ |

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# Reteaching 10-4

## Solving Quadratic Equations

**OBJECTIVE:** Solving quadratic equations in  $ax^2 = c$  form

**MATERIALS:** Calculator

Quadratic equations written in the form  $x^2 = c$  can be solved by finding the square root of each side.

Value of $c$	No. of Real Solutions	$x$ -Intercepts
$c > 0$	2	$(+\sqrt{c}, 0)(-\sqrt{c}, 0)$
$c = 0$	1	$(0, 0)$
$c < 0$	0	none

Note: Every parabola has two roots, but they are not always real number roots; they could be complex or a double root.

### Example

Solve  $3x^2 - 48 = 0$ .

$$3x^2 - 48 + 48 = 0 + 48$$

← Add 48 to each side.

$$3x^2 = 48$$

$$x^2 = 16$$

← Divide each side by 3.

$$x = \pm \sqrt{16}$$

← Find the square roots.

$$x = \pm 4$$

← Simplify.

$$3(4)^2 - 48 = 0$$

$$3(-4)^2 - 48 = 0$$

← Check the results in the original equation.

$$3(16) - 48 = 0$$

$$3(16) - 48 = 0$$

$$48 - 48 = 0$$

$$48 - 48 = 0$$

### Exercises

Fill in the following chart to find the solutions to each equation.

	1. $4x^2 = 100$	2. $2x^2 - 6 = 0$	3. $x^2 + 4 = 0$	4. $81x^2 - 5 = 20$
Rewrite in $ax^2 = c$ form.				
Rewrite in $x^2 = \frac{c}{a}$ form.				
Find the square roots.				
Solutions				

# Reteaching 10-5

## Factoring to Solve Quadratic Equations

**OBJECTIVE:** Solving quadratic equations by factoring

**MATERIALS:** None

The Zero-Product Property can be used when factoring quadratic equations. It states that if the product of two numbers equals zero, then one of its factors is zero. For example, if  $(x - 2)(x + 1) = 0$ , then either  $(x - 2) = 0$  or  $(x + 1) = 0$ . This property allows you to solve a quadratic equation.

### Example

Solve  $2x^2 - x = 3$  by factoring.

$$2x^2 - x = 3$$

$$2x^2 - x - 3 = 0 \quad \leftarrow \text{Subtract 3 from each side.}$$

$$(2x - 3)(x + 1) = 0 \quad \leftarrow \text{Factor } 2x^2 - x - 3.$$

$$2x - 3 = 0 \text{ or } x + 1 = 0 \quad \leftarrow \text{Use the Zero Product Property.}$$

$$2x = 3 \text{ or } x = -1 \quad \leftarrow \text{Solve for } x.$$

$$x = \frac{3}{2} \text{ or } x = -1$$

The solutions are  $\frac{3}{2}$  and  $-1$ .

Check      Substitute  $\frac{3}{2}$  for  $x$ .

$$\left(2\left(\frac{3}{2}\right) - 3\right)\left(\frac{3}{2} + 1\right) \stackrel{?}{=} 0$$

$$(3 - 3)\left(\frac{5}{2}\right) \stackrel{?}{=} 0$$

$$(0)\left(\frac{5}{2}\right) = 0 \checkmark$$

Substitute  $-1$  for  $x$ .

$$(2(-1) - 3)(-1 + 1) \stackrel{?}{=} 0$$

$$(-2 - 3)(0) \stackrel{?}{=} 0$$

$$(-5)(0) = 0 \checkmark$$

### Exercises

Solve by factoring.

1.  $x^2 + 7x + 10 = 0$

2.  $x^2 - x = 12$

3.  $x^2 - 5x + 6 = 0$

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

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

6.  $3x^2 + 2x - 8 = 0$

7.  $x^2 - 3x - 28 = 0$

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

9.  $6x^2 + 2x = 4$

**Reteaching 10-6**

Completing the Square

**OBJECTIVE:** Solving quadratic equations by completing the square**MATERIALS:** None

Remember that to complete the square, the coefficient of the squared term is 1 and the constant term is moved to the right side of the equation.

**Example**Solve by completing the square:  $2x^2 - 16x - 40 = 0$ 

$$2x^2 - 16x - 40 = 0$$

$$x^2 - 8x - 20 = 0$$

← Divide each side by 2.

$$x^2 - 8x = 20$$

← Add 20 to each side.

$$x^2 - 8x + 16 = 20 + 16$$

← Take  $\frac{1}{2}$  the coefficient of  $x$ , square it, and add to both sides.

$$(x - 4)^2 = 36$$

← Write the left hand side as a square.

$$\sqrt{(x - 4)^2} = \sqrt{36}$$

← Take the square root of each side.

$$x - 4 = \pm 6$$

← Simplify.

$$x - 4 = 6 \quad \text{or} \quad x - 4 = -6$$

← Write as two equations.

$$x = 10 \quad \text{or} \quad x = -2$$

← Solve.

Check by substituting  $x = 10$  and  $x = -2$  into the original equation.

**Exercises**

Tell what is done in each step of the solution.

1.  $3x^2 + 6x - 45 = 0$

e.  $\sqrt{(x + 1)^2} = \sqrt{16}$

a.  $x^2 + 2x - 15 = 0$

f.  $x + 1 = \pm 4$

b.  $x^2 + 2x = 15$

g.  $x + 1 = 4$  or  $x + 1 = -4$

c.  $x^2 + 2x + 1 = 15 + 1$

h.  $x = 3$  or  $x = -5$

d.  $(x + 1)^2 = 16$

Solve each equation by completing the square. Express all radicals to the nearest hundredth.

2.  $x^2 - 10x + 16 = 0$

3.  $x^2 - 12x + 32 = 0$

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

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

# Reteaching 10-7

Using the Quadratic Formula

**OBJECTIVE:** Using the quadratic formula to solve quadratic equations

**MATERIALS:** Calculator

- The quadratic formula can be used to solve any quadratic equation.
- When the quadratic equation is in standard form ( $ax^2 + bx + c = 0$ ), where  $a \neq 0$ , the solutions are found by the quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

## Example

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

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

$$x^2 + 5x - 14 = 0$$

$$\begin{matrix} a & b & c \\ x^2 + 5x - 14 = 0 \end{matrix}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-5 \pm \sqrt{5^2 - 4(1)(-14)}}{2(1)}$$

$$x = \frac{-5 \pm \sqrt{25 + 56}}{2}$$

$$x = \frac{-5 \pm \sqrt{81}}{2}$$

$$x = \frac{-5 \pm 9}{2}$$

$$x = \frac{-5 + 9}{2} \quad \text{or} \quad x = \frac{-5 - 9}{2}$$

$$x = 2 \quad \text{or} \quad x = -7$$

← Rewrite in standard form.

← Write  $a$ ,  $b$ ,  $c$  above the appropriate numbers.  
( $a = 1$ ,  $b = 5$ ,  $c = -14$ )

← Use the quadratic formula.

← Substitute 1 for  $a$ , 5 for  $b$ , and  $-14$  for  $c$ .

← Solve.

← Simplify.

← Write two equations.

← Solve for  $x$ .

The solutions are  $x = 2$  or  $x = -7$ .

## Exercises

Use the quadratic formula to solve each equation. If necessary, round answers to the nearest hundredth.

1.  $3x^2 + 7x + 2 = 0$

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

3.  $4y^2 = 3 - 5y$

4.  $2 = 11z - 5z^2$

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

6.  $-3x^2 + x + 5 = 0$

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

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



# Reteaching 10-8

Using the Discriminant

**OBJECTIVE:** Using the discriminant to find the number of solutions of a quadratic equation

**MATERIALS:** Calculator

In the quadratic formula  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ , the discriminant is the

expression under the radical sign,  $b^2 - 4ac$ . The discriminant determines how many solutions, or  $x$ -intercepts, a quadratic equation has.

- If the discriminant is positive, there are two real solutions.
- If the discriminant is 0, there is one real solution.
- If the discriminant is negative, there are no real solutions.

### Example

Find the value of the discriminant and the number of real solutions for each quadratic equation.

$ax^2 + bx + c = 0$	Discriminant ( $b^2 - 4ac$ )	Number of Solutions	Number of $x$ -intercepts
1. $x^2 + 2x + 3 = 0$	$(2)^2 - 4(1)(3) = -8$	none	none
2. $x^2 - 2x + 1 = 0$	$(-2)^2 - 4(1)(1) = 0$	one	one
3. $x^2 - 2x - 2 = 0$	$(-2)^2 - 4(1)(-2) = 12$	two	two

### Exercises

Find the value of the discriminant and the number of solutions for each quadratic equation.

$ax^2 + bx + c = 0$	Discriminant ( $b^2 - 4ac$ )	Number of Solutions	Number of $x$ -intercepts
1. $2x^2 + 3x + 3 = 0$			
2. $x^2 - 2x + 4 = 0$			
3. $3x^2 - 6x + 3 = 0$			

Find the value of the discriminant and the number of solutions of each equation.

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

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

6.  $5x^2 - 2x + 3 = 0$

# Reteaching 10-9

## Choosing a Linear, Quadratic, or Exponential Model



**OBJECTIVE:** Choosing a linear, quadratic, or exponential model      **MATERIALS:** None

When analyzing data to determine whether the model that best fits the data is linear, exponential, or quadratic, use the following guidelines.

<b>Linear</b> ( $y = mx + b$ )	The $y$ -coordinates have a common difference.
<b>Exponential</b> ( $y = a \cdot b^x$ )	The $y$ -coordinates have a common ratio.
<b>Quadratic</b> ( $y = ax^2 + bx + c$ )	The $y$ -coordinates have a common second difference.

### Example

Which kind of function best models the data below? Write an equation to model the data.

$x$	-2	-1	0	1	2
$y$	$\frac{3}{4}$	$\frac{3}{2}$	3	6	12

The  $y$ -coordinates have a common ratio, 2. Notice that each  $y$ -coordinate is equal to the previous  $y$ -coordinate multiplied by 2. The data is best modeled by an exponential function. To determine the function

$$y = a \cdot b^x,$$

let  $a$  = the value of  $y$  when  $x = 0$ ;

let  $b$  = the common ratio, 2.

$$y = 3 \cdot 2^x$$

### Exercises

Determine the function that best models the data. Write an equation to model the data.

1. 

$x$	-2	-1	0	1	2
$y$	-7	-4	-1	2	5

2. 

$x$	-2	-1	0	1	2
$y$	-8	-2	0	-2	-8

3. 

$x$	0	1	2	3	4
$y$	2	$\frac{5}{2}$	3	$\frac{7}{2}$	4

4. 

$x$	-2	-1	0	1	2
$y$	$-\frac{2}{9}$	$-\frac{2}{3}$	-2	-6	-18

5. 

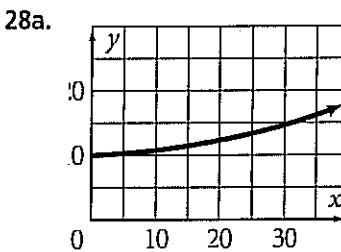
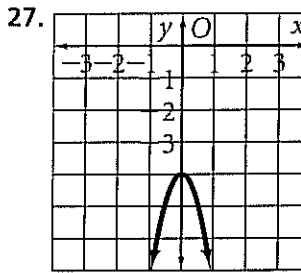
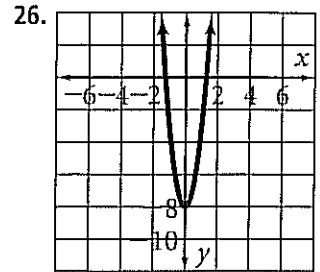
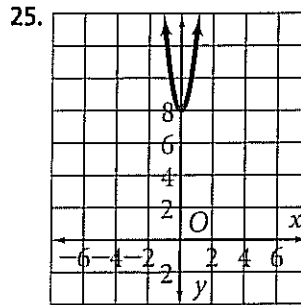
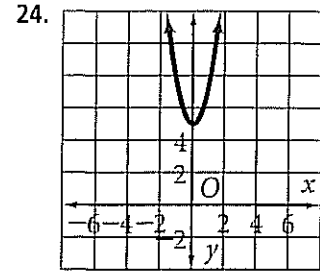
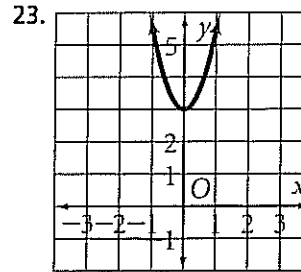
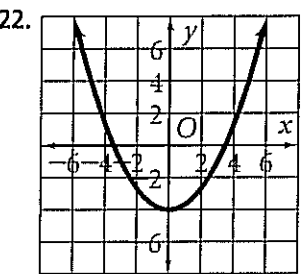
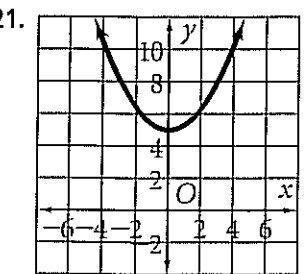
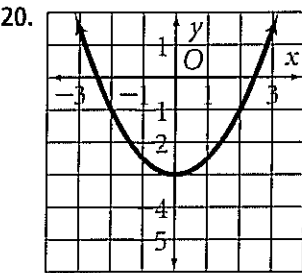
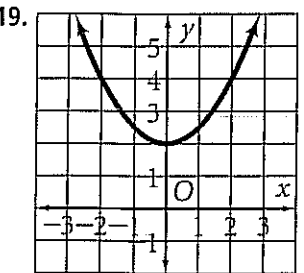
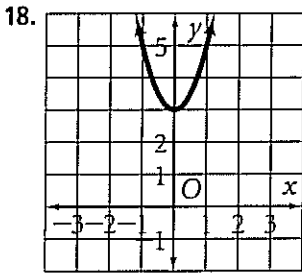
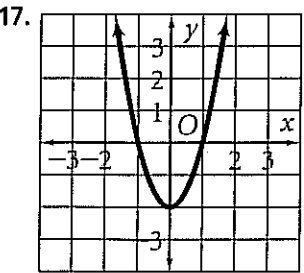
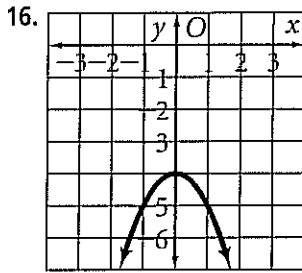
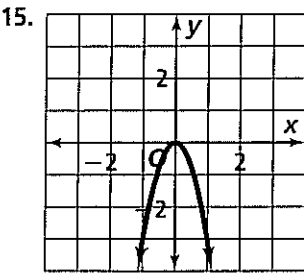
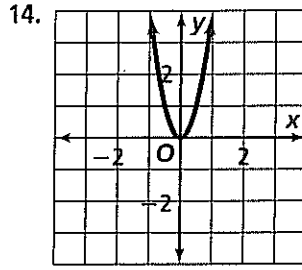
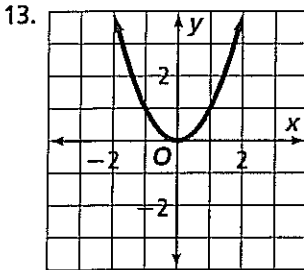
$x$	-4	-3	-2	-1	0
$y$	4	$\frac{9}{4}$	1	$\frac{1}{4}$	0

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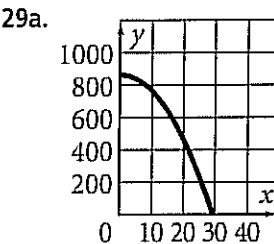
# Chapter 10 Answers

## Practice 10-1

1. (0,0); maximum 2. (0,0); maximum 3. (0,0); minimum 4. (0,0); minimum 5. (0,0); maximum 6. (0,0); minimum  
 7.  $y = x^2, y = 3x^2, y = 5x^2$  8.  $y = \frac{1}{2}x^2, y = -x^2, y = -8x^2$   
 9.  $y = 2x^2, y = -4x^2, y = 5x^2$  10.  $y = \frac{1}{3}x^2, y = -\frac{1}{2}x^2,$   
 $y = -3x^2$  11.  $y = 4x^2, y = 6x^2, y = -7x^2$   
 12.  $y = \frac{1}{5}x^2, y = \frac{3}{4}x^2, y = 2x^2$



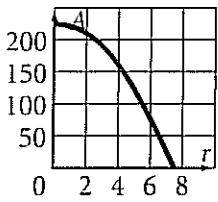
28b. Answers may vary. Sample: Domain should be nonnegative values. Months cannot be negative. 28c. Answers may vary. Sample: Range should be greater than or equal to 10. The minimum value is 10.



29b. Answers may vary. Sample: Domain should be nonnegative values less than or equal to 24. Length of the photograph cannot be negative and cannot be greater than 24. 29c. Answers may vary. Sample: Range should be between 288 and 864. These are the minimum and maximum areas available for printing.

# Chapter 10 Answers (continued)

30a.



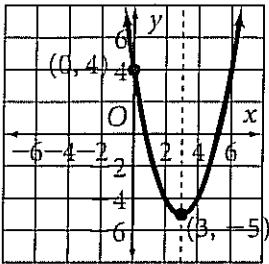
30b. Answers may vary. Sample: Domain should be nonnegative, and less than or equal to 7.5. Radius cannot be negative, and not larger than one half the width of the square.

30c. Answers may vary. Sample: Range should be between 48 and 225. These are close to the minimum and maximum areas.

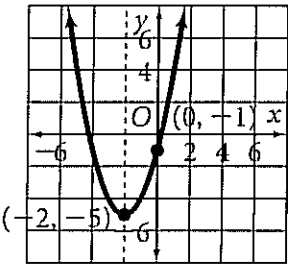
## Practice 10-2

1.  $x = 5$ ;  $(5, -23)$  2.  $x = -6$ ;  $(-6, -45)$  3.  $x = 1$ ;  $(1, 2)$   
 4.  $x = -3$ ;  $(-3, -18)$  5.  $x = 0$ ;  $(0, 3)$  6.  $x = 2$ ;  $(2, 16)$   
 7.  $x = -4$ ;  $(-4, -10)$  8.  $x = 3$ ;  $(3, 42)$  9.  $x = 2$ ;  $(2, 6)$

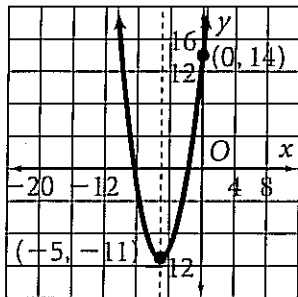
10.



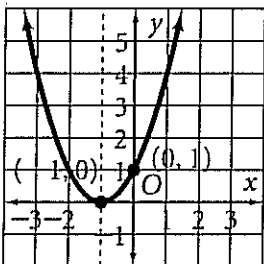
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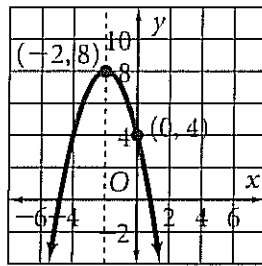
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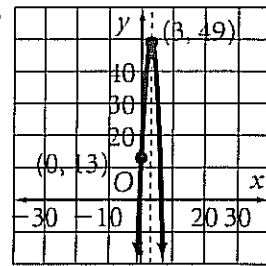
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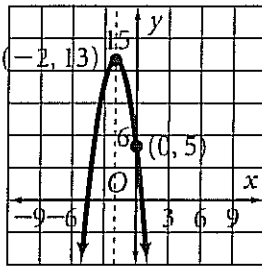
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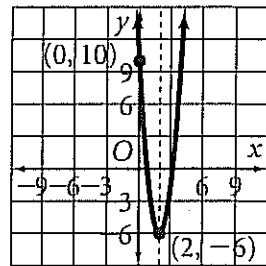
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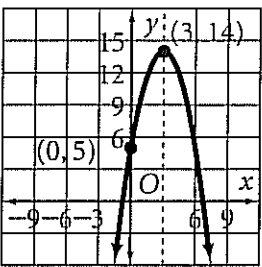
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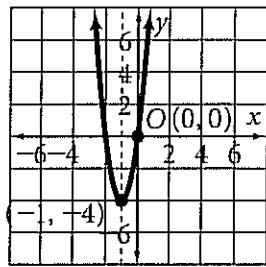
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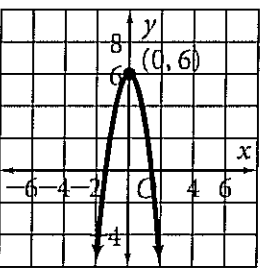
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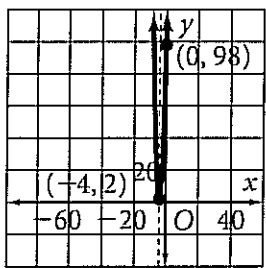
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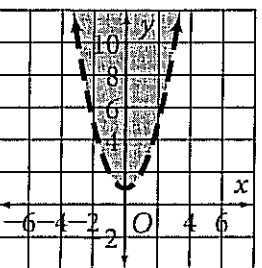
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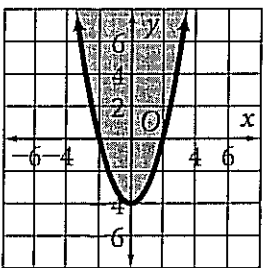
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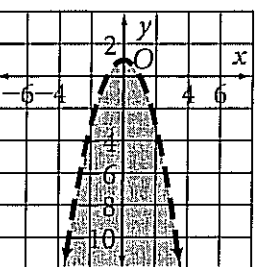
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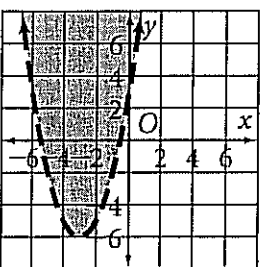
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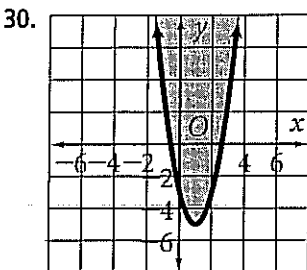
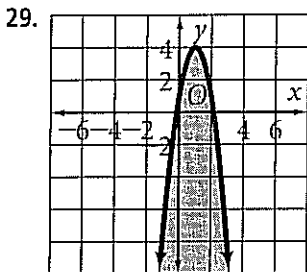
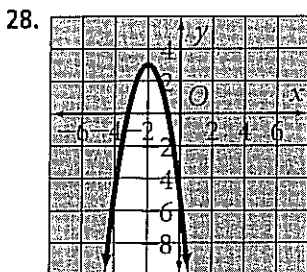
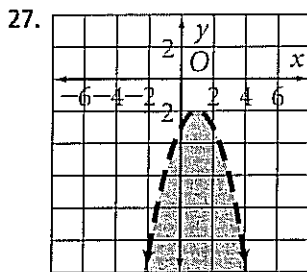
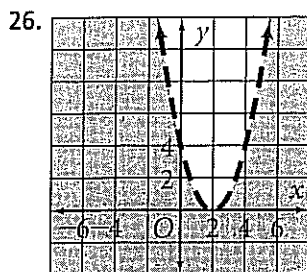
24.



25.



# Chapter 10 Answers (continued)



31. (3, -9); minimum 32. (-4, -1); maximum 33. (0.5, 0); maximum 34. (-2, 4); maximum 35. (32, -47.2); minimum 36. (4.5, 18.25); maximum 37. 21 ft; yes 38. \$4843.75 39. 2.25 ft; no

## Practice 10-3

1. Rational 2. Rational 3. Irrational 4. Rational  
5. Irrational 6. Irrational 7. Rational 8. Rational 9. 4.47  
10. 8.54 11. -6.16 12. 11.40 13. 12.22 14. -2.95  
15. 14.62 16. -17.91 17. 10.67 18. -28.99 19. -36.73  
20. 30.47 21. 7 22. -1.5 23.  $\frac{1}{4}$  24. 20 25. 2.5  
26.  $\pm\frac{6}{5}$  27. 14 28. 1.6 29. 0.5 30.  $\pm\frac{3}{10}$  31. 24  
32.  $\pm\frac{11}{6}$  33. 40 34. -0.2 35. 50 36. 2.1 37. 6 and 7  
38. 11 and 12 39. -9 and -8 40. 9 and 10 41. -11 and -10  
42. -14 and -13 43. 33 and 34 44. 14 and 15 45a. 4.2 ft  
45b. 6.4 ft 45c. 7.1 ft 45d. 11.3 ft 46. 30.9 ft

## Practice 10-4

1.  $\pm 4$  2.  $\pm 12$  3.  $\pm 3$  4. No solution 5.  $\pm 3.46$  6.  $\pm 7$   
7. No solution 8.  $\pm 10$  9.  $\pm 4$  10.  $\pm 8.94$  11.  $\pm\frac{5}{9}$  12.  $\pm 6.71$   
13.  $\pm 17.32$  14.  $\pm 2.83$  15. No solution  
16.  $\pm 8$  17.  $\pm\frac{1}{2}$  18.  $\pm 11$  19.  $\pm 1.41$  20.  $\pm 3.32$  21.  $\pm 4.20$

22.  $\pm 6.36$  23. No solution 24. No solution 25.  $\pm\frac{1}{3}$  26. 0  
27.  $\pm 25$  28.  $\pm 3$  29.  $\pm 14$  30.  $\pm 10.49$  31.  $\pm 0.87$  32.  $\pm 5$   
33. No solution 34.  $\pm 1.73$  35. 0 36.  $\pm 3.16$  37.  $\pm 1$  38.  $\pm 5$   
39. No solution 40.  $\pm 20$  41.  $\pm 2$  42.  $\pm 26.46$  43.  $\pm 3.61$   
44.  $\pm 2$  45. No solution 46.  $\pm 2.24$  47.  $\pm 1.73$  48.  $\pm 15$   
49.  $\pm 1.12$  50.  $\pm 12$  51.  $\pm 1.73$  52. 90 ft 53. 6 in.  
54. 35.8 ft/s 55. 9.8 ft 56. 160 ft/s

## Practice 10-5

1. -5, 3 2. 2, -9 3. 12, -12 4. -1.5, 4 5. -7, 1.25  
6. -3.5, 3.5 7.  $\frac{7}{3}$ , -0.5 8.  $\frac{3}{8}$ , -0.25 9. -1.2, -1.25 10. -3, -2  
11. 9, -2 12. -2, 2 13. -10, 2 14. -13, -1 15. 5, -2  
16. -8, 1 17. 5, -5 18. -7, -3 19. 4, -8 20. 3, 9  
21. -3, 3 22. 3.5, -3 23. 2,  $\frac{5}{3}$  24. 4.5, -1 25. 4, -1.5  
26. 1,  $\frac{2}{3}$  27. 3, 0.4 28. 3.5,  $-\frac{4}{3}$  29. 2.5, -1.5 30. 1, -0.75  
31. 14 in., 13 in. 32. 14 in., 9 in. 33. 10 in. by 19 in. 34. 1.5 s  
35. -8, 9 36. -1, 10 37. -21, 21 38. 12, 2.6 39. -2.5, 13  
40. 7, -13 41. -12, 6 42. -3.5, 1.5 43. 2.5, 1.6 44. -12, 8  
45. -1.5, 8 46. 10, -15 47.  $\frac{1}{3}$ , -3 48.  $\frac{1}{6}$ ,  $-\frac{21}{5}$  49. -9, 9  
50. -17, -18 51. 11, -11 52. 9, 12

## Practice 10-6

1. 49 2.  $\frac{1}{81}$  3.  $\frac{4}{81}$  4.  $\frac{1}{36}$  5. 5, -1 6. -1, 2 7. -1.36, 7.36  
8. -2 9. 6, -3 10. -0.47, 8.47 11. 6, 0 12. -1.12, 7.12  
13. 0, 7 14. 2, -6 15. -10, -1 16. -5, 3 17. 9, -1  
18. -2, -3 19. -10, 12 20. 15, 7 21. 3,  $-\frac{3}{2}$  22. -5, 1  
23. 2,  $-\frac{1}{2}$  24. -8, 2 25.  $\frac{1}{3}$ , -6 26.  $-\frac{7}{2}$ , 4 27. 1,  $\frac{1}{3}$   
28. 3,  $-\frac{1}{2}$  29.  $\frac{7}{3}$ , -2 30. 5, 3 31.  $\frac{3}{2}$ , -2 32.  $\frac{1}{3}$ , -1  
33.  $-\frac{4}{5}$ ,  $\frac{1}{2}$  34.  $\frac{5}{3}$ ,  $\frac{3}{4}$

## Practice 10-7

1. -7.32, -0.68 2. -6, 6 3. -8, 12 4. -11, 14 5. -3.5, 6.5  
6. -6, 4.2 7. 32.87, 2.13 8. 13, -19 9. -14.72, 2.72  
10. 4.5, -4.5 11. -10, -3 12. -11, 12 13. 0.33, 3.5  
14. -9, 0.75 15. -1, 1 16. -12.31, 7.31 17. -2, 2  
18. No real solutions 19. 0.17, -13 20. 4, -0.6 21. -3, 18  
22. -0.67, 0.67 23. 3.5, 9.5 24. -1.75, -34.25 25. 20, -18  
26. No real solutions 27. -3, 13 28. -2.61, 0.86 29. 15, 4.5  
30. No real solutions 31. 37.32, 2.68 32. -1.82, -1.30  
33. 2.83, -2.83 34. -8.93, 1.68 35. -4, -6.75  
36. No real solutions 37. -2, 2 38. -0.75, 0.75 39. -26, 25  
40. 19.05, 0.45 41. No real solutions 42. 16.34, -7.34  
43. 4.5, 0.25 44. 3.5, -3.5 45. 5.67, 2.33 46. No real solutions  
47. 3.17, -1 48. -3, 3 49. 6.5, -8.5 50. 2.83, -7  
51. 29.21, 0.29 52. 21.41 in. by 31.41 in. 53. 1.14 s  
54. 19.46 ft by 19.46 ft 55. base 14 in., height 60 in.

# Chapter 10 Answers (continued)

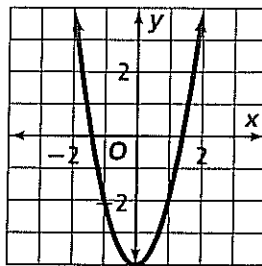
## Practice 10.8

- 1.0 2.2 3.1 4.2 5.0 6.0 7.1 8.2 9.2 10.0  
 11.2 12.1 13.0 14.2 15.2 16.1 17.0 18.1 19.2  
 20.2 21.2 22.2 23.2 24.0 25. no 26. yes 27a. yes  
 27b. no 28. no 29.2 30.0 31.2 32.2 33.2 34.0  
 35.2 36.1 37.0 38.0 39.1 40.2

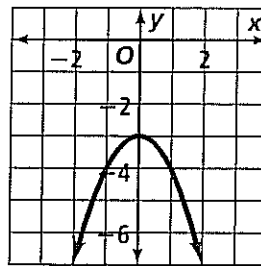
## Practice 10-9

1. Quadratic;  $y = 3x^2$  2. Linear;  $y = -2x$  3. Exponential;  
 $y = 4^x$  4. Linear;  $y = \frac{1}{3}x + 1$  5. Exponential;  $y = 3 \cdot 3^x$   
 6. Quadratic;  $y = -2x^2$  7. Quadratic;  $y = \frac{1}{2}x^2$   
 8. Linear;  $y = -2x - 4$  9. Quadratic;  $y = -\frac{1}{4}x^2$   
 10. Exponential;  $y = -2 \cdot 4^x$  11. Quadratic;  $y = -5x^2$   
 12. Linear;  $y = -\frac{1}{2}x + \frac{1}{2}$  13. Linear;  $y = \frac{1}{3}$   
 14. Exponential;  $y = -\frac{1}{2} \cdot 2^x$  15a. Linear  
 15b.  $y = 32x + 100$  15c. \$964 15d. 168 computers  
 16a. Exponential 16b.  $y = 110 \cdot 1.2^x$  16c. 5061

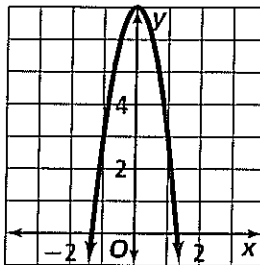
7. upward, down four



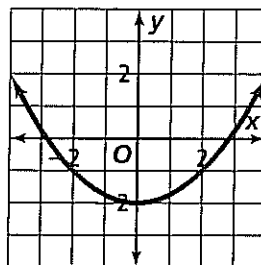
8. downward, down three



9. downward, up seven

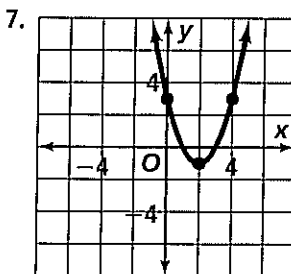
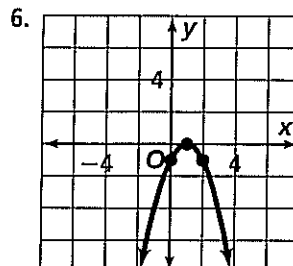
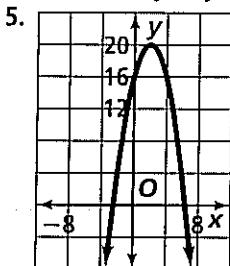


10. upward, down two



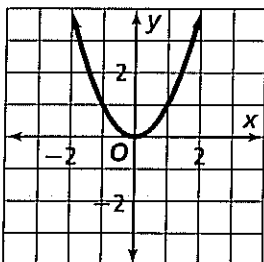
## Reteaching 10-2

1.  $y = -x^2 + 4x + 16$  2.  $x = 2$  3. (2, 20)  
 4. Answers may vary.

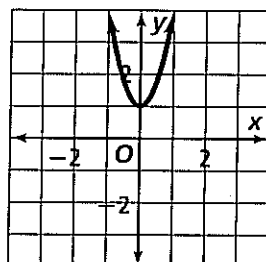


## Reteaching 10-1

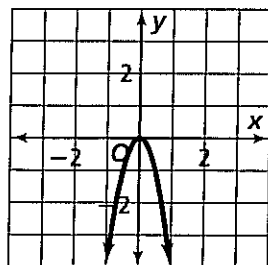
1. upward, zero



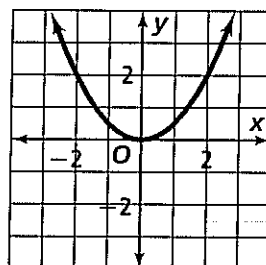
2. upward, up one



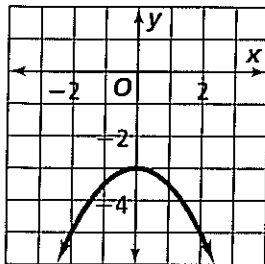
3. downward, zero



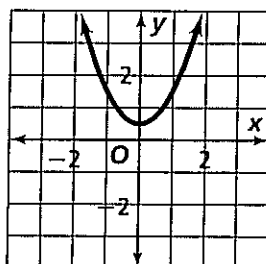
4. upward, zero



5. downward, down three



6. upward, up one-half



# Chapter 10 Answers (continued)

## Reteaching 10-3

Number	Principal Square Root	Negative Square Root	Rational/Irrational	Perfect Square or $\sqrt{\quad}$ Between Which Two Consecutive Integers
$\frac{1}{64}$	$\frac{1}{8}$	$-\frac{1}{8}$	rational	perfect square
26	5.099 ...	-5.099 ...	irrational	between 5 and 6
23	4.795 ...	-4.795 ...	irrational	between 4 and 5
-36	undefined	undefined	undefined	undefined
$\frac{81}{324}$	$\frac{1}{2}$	$-\frac{1}{2}$	rational	perfect square

2. 10; rational 3. 3.464 ...; irrational 4. undefined 5. 7.937 ...; irrational 6. 0; rational 7.  $-\frac{1}{3}$ ; rational

## Reteaching 10-4

1. $4x^2 = 100$	2. $2x^2 = 6$	3. $x^2 = -4$	4. $81x^2 = 25$
$x^2 = 25$	$x^2 = 3$	$x^2 = -4$	$x^2 = \frac{25}{81}$
$x = \pm\sqrt{25}$	$x = \pm\sqrt{3}$	$x = \pm\sqrt{-4}$	$x = \pm\sqrt{\frac{25}{81}}$
$x = \pm 5$	$x = \pm\sqrt{3}$	no solution	$x = \pm\frac{5}{9}$

## Reteaching 10-5

1. -2, -5 2. 4, -3 3. 2, 3 4. 4, 2 5. -1.5, -1 6.  $\frac{4}{3}$ , -2  
7. -4, 7 8. 2.5, -2 9.  $\frac{2}{3}$ , -1

## Reteaching 10-6

1a. Divide both sides by 3. 1b. Add 15 to both sides.  
1c. Square  $\frac{1}{2}$  the coefficient of  $x$ , and add to both sides.  
1d. Write the right side as a square. 1e. Take the square root of both sides. 1f. Simplify and solve for  $x$ . 1g. Write two equations. 1h. Solve. 2. 8, 2 3. 8, 4 4. 0.26, 11.74  
5. 0.58, -8.58

## Reteaching 10-7

1.  $-\frac{1}{3}$ , -2 2. -2, -1 3. 0.44, -1.69 4. 2,  $\frac{1}{5}$   
5. -6, 1 6. 1.47, -1.14 7. 4, -1 8. 1.45, -1.20

## Reteaching 10-8

1. -15; none; none 2. -12; none; none 3. 0; one; one  
4. 0; one 5. 7; two 6. -56; none

## Reteaching 10-9

1. Linear;  $y = 3x - 1$  2. Quadratic;  $y = -2x^2$   
3. Linear;  $y = \frac{1}{2}x + 2$  4. Exponential;  $y = -2 \cdot 3^x$   
5. Quadratic;  $y = \frac{1}{4}x^2$

## Enrichment 10-1

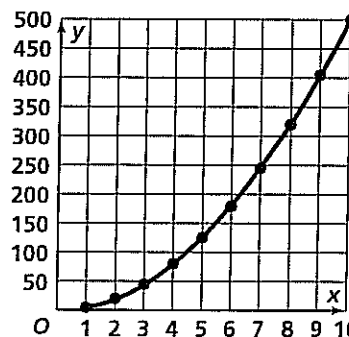
1. 11 2. Parabola 3. Check students' work. 4. Check students' work. 5. 15 to 1, 14 to 2, 13 to 3, 12 to 4, 11 to 5, 10 to 6, 9 to 7, 8 to 8, 7 to 9, 6 to 10, 5 to 11, 4 to 12, 3 to 13, 2 to 14, and 1 to 15. 6. The sum is always 1 more than the number of points in the design.

## Enrichment 10-2

1. 500 m 2. No 3. An object falls 5 m during the first second, 15 m during the second second, 25 m during the third second, and so on.

$t$ (s)	$d = \frac{1}{2}gt^2$ (m)
1	5
2	20
3	45
4	80
5	125
6	180
7	245
8	320
9	405
10	500

4. a curve that becomes increasingly steeper as time increases



5. The relationship between  $d$  and  $t$  is a quadratic function,  $d = 5t^2$  and is therefore a parabola.