

3. Practice

Assignment Guide

1 Objective

- A B** Core 1–19, 33–35, 54–61
- C** Extension 62

2 Objective

- A B** Core 20–32, 36–53
- C** Extension 63–66

Standardized Test Prep 67–73

Mixed Review 74–83

Technology Tip

Exercises 20–31 If students use the zero feature on the CALC menu, it is crucial to select the left bound first and the right bound second. Selecting the bounds in the opposite order will result in an error message. Remind students to repeat the procedure for each point where the parabola crosses the x-axis.

Error Prevention

Exercise 62 Be sure students understand that the matrix on the left is to be multiplied by itself. The exponent does *not* indicate that the individual elements of the matrix are to be squared.

Enrichment 5-5

reteaching 5-5

Practice 5-5

Practice 5-5 Quadratic Equations

Solve each equation by factoring, by taking square roots, or by graphing. When necessary, round your answer to the nearest hundredth.

1. $x^2 - 3x - 4 = 0$	2. $3x^2 = 5x$	3. $5x^2 = 15x$
4. $x^2 - 6x - 7 = 0$	5. $x^2 - 49 = 0$	6. $x^2 - 2x + 1 = 0$
7. $x^2 - 9 = 0$	8. $x^2 - 3x - 4 = 0$	9. $x^2 - 9x^2 + 20 = 0$
10. $3x^2 + 4 = -10x$	11. $(x + 5)^2 = 36$	12. $2x^2 - 3x = 0$
13. $2x^2 + 4 = 3x$	14. $-2x^2 + 3x = -1$	15. $5x^2 - 6x + 1 = 0$
16. $3x^2 + 4 = -10x$	17. $-2x^2 + 2 = -3x$	18. $6x^2 + 1 = 5x$
19. $3x^2 + 4 = -10x$	20. $3x^2 + 5x = 2$	21. $x^2 - 6x = -8$
22. $3x^2 + 4 = -10x$	23. $6x^2 + 18x = 0$	24. $2x^2 + 5 = 11x$
25. $3x^2 + 4 = -10x$	26. $2x^2 - 3x = -1$	27. $3x^2 - 2 = -6$
28. $3x^2 + 4 = -10x$	29. $4x^2 + 2 = 6x$	30. $5x^2 + 2 = -3x$
31. $3x^2 + 4 = -10x$	32. $2x^2 - 6x = -4$	33. $11x^2 - 12x + 1 = 0$
34. $3x^2 + 4 = -10x$	35. $x^2 + 9 = -10x$	36. $(x - 2)^2 = 18$
37. $3x^2 + 4 = -10x$	38. $x^2 - 16 = 0$	39. $x^2 - 6x = -8$
40. $3x^2 + 4 = -10x$	41. $2x^2 + 6 = -7x$	42. $6x^2 - 2 = -7x$
43. $3x^2 + 4 = -10x$	44. $10x^2 - 6x = 1$	45. $10x^2 + 12x + 1 = 0$
46. $3x^2 + 4 = -10x$	47. $3x^2 + 4 = -10x$	48. $6x^2 + 4 = 9x = 0$
49. $3x^2 + 4 = -10x$	50. $2x^2 + 9x + 4 = 0$	51. $2x^2 + 6x = -4$
52. $3x^2 + 4 = -10x$	53. $4x^2 = 1$	54. $6x^2 = 12x$
55. $3x^2 + 4 = -10x$	56. $2x^2 + 11x = 6$	57. $8x^2 - 6x + 1 = 0$
58. $3x^2 + 4 = -10x$	59. $6x^2 + 2 = 13x$	60. $x^2 = 131$
61. $3x^2 + 4 = -10x$	62. $6x^2 + 6x + 1 = 0$	63. $x^2 + 9x + 8 = 0$
64. $3x^2 + 4 = -10x$	65. $x^2 + 6x = 40$	66. $2x^2 = 6$
67. $3x^2 + 4 = -10x$	68. $x^2 - 2x - 6 = 0$	69. $x^2 - 12 = 0$
70. $3x^2 + 4 = -10x$	71. $5x^2 - 36x = 0$	72. $16x^2 = 81$
73. $3x^2 + 4 = -10x$	74. $x^2 - 3x = -13x$	75. $x^2 + 6 = 5x$

EXERCISES

For more practice, see *Extra Practice*

Practice and Problem Solving

A Practice by Example

Example 1
(page 263)

Example 2
(page 264)

Example 3
(page 264)

Solve each equation by factoring. Check your answers.

1. $x^2 + 6x + 8 = 0$ **-4, -2** 2. $x^2 + 18 = 9x$ **3, 6** 3. $2x^2 - x = 3$ **-2, 3**
 4. $x^2 - 10x + 25 = 0$ **5** 5. $2x^2 + 6x = -4$ **-2, -1** 6. $3x^2 = 16x + 12$ **$-\frac{2}{3}, 6$**

Solve each equation by finding square roots.

7. $5x^2 = 80$ **-4, 4** 8. $x^2 - 4 = 0$ **-2, 2** 9. $2x^2 = 32$ **-4, 4**
 10. $9x^2 = 25$ **$-\frac{5}{3}, \frac{5}{3}$** 11. $3x^2 - 15 = 0$ **$-\sqrt{5}, \sqrt{5}$** 12. $5x^2 - 40 = 0$ **$-2\sqrt{2}, 2\sqrt{2}$**

Solve each equation by factoring or by taking square roots.

13. $x^2 - 4x = 0$ **0, 4** 14. $6x^2 + 4x = 0$ **$-\frac{2}{3}, 0$** 15. $12x^2 - 147 = 0$
 16. $3x^2 = 48$ **-4, 4** 17. $2x^2 = x + 3$ **$-1, \frac{3}{2}$** 18. $4x^2 - 80 = 0$ **$-2\sqrt{5}, 2\sqrt{5}$**

19. Firefighters A smoke jumper jumps from a plane that is 1700 ft above the ground. The function $y = -16t^2 + 1700$ gives the jumper's height y in feet at t seconds.

- a. How long is the jumper in free fall if the parachute opens at 1000 ft? **about 6.61 s**
- b. How long is the jumper in free fall if the parachute opens at 940 ft? **about 6.89 s**

Examples 4 and 5
(page 265)

Solve each equation by graphing. If necessary, round your answer to the nearest hundredth. **20–31. See margin.**

20. $x^2 + 5x + 3 = 0$ 21. $x^2 - 7x = 11$ 22. $2x^2 - x = 2$
 23. $6x^2 = -19x - 15$ 24. $3x^2 - 5x - 4 = 0$ 25. $5x^2 - 7x - 3 = 0$
 26. $6x^2 + 31x = 12$ 27. $1 = 4x^2 + 3x$ 28. $\frac{1}{2}x^2 - x = 8$
 29. $x^2 = 4x + 8$ 30. $x^2 + 4x = 6$ 31. $2x^2 - 2x - 5 = 0$

B Apply Your Skills

32a. Answers may vary.
Sample:

$$\frac{\ell}{w} \approx \frac{7.2}{4.4} \approx 1.6$$

b. the tree trunk

- 32. a. Art** Verify that the Chinese painting at the right is a golden rectangle. **a–b. See left.**
b. What element in the painting divides it into a square and another golden rectangle?



- 33. Physics** The period of a pendulum is the time the pendulum takes to swing back and forth. The function $\ell = 0.81t^2$ relates the length ℓ in feet of a pendulum to the time t in seconds that it takes to swing back and forth.
a. Find the period of a pendulum that is 2.5 ft long.
b. The convention center in Portland, Oregon, has the longest pendulum in the United States. The pendulum's length is 90 ft. Find the period.

34. Open-Ended Write an equation in standard form that you can solve by factoring and an equation that you cannot solve by factoring. **Check students' work.**

266 Chapter 5 Quadratic Equations and Functions

pages 266–268 Exercises

20. **-4.30, -0.70**
 21. **-1.32, 8.32**
 22. **-0.78, 1.28**
 23. **-1.67, -1.5**

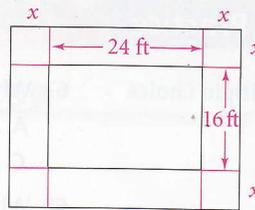
24. **-0.59, 2.26**
 25. **-0.94, 2.34**
 26. **-5.53, 0.36**
 27. **-1, 0.25**
 28. **-3.12, 5.12**

29. **-1.46, 5.46**
 30. **-5.16, 1.16**
 31. **-1.16, 2.16**

33a. **$\frac{5\sqrt{10}}{9}$ or about 1.76 s**

4. Assess

- 35. Gardening** Suppose you want to expand the garden shown at the right by planting a border of flowers. The border will be of the same width around the entire garden. The flowers you bought will fill an area of 276 ft^2 . How wide should the border be? **3 ft**



Solve each equation by factoring, by taking square roots, or by graphing. If necessary, round your answer to the nearest hundredth. 36–53. See margin.

36. $x^2 + 6x + 5 = 45$ 37. $x^2 - 11x + 24 = 0$ 38. $3x^2 = 27$
 39. $2x^2 - 5x - 3 = 0$ 40. $x^2 + 2x = 6 - 6x$ 41. $6x^2 + 13x + 6 = 0$
 42. $2x^2 + 8x = 5x + 20$ 43. $7x^2 - 243 = 0$ 44. $3x^2 + 7x = 9$
 45. $12x^2 - 154 = 0$ 46. $x^2 + 4x = 0$ 47. $x^2 = 8x - 7$
 48. $x^2 + 2x = 15$ 49. $x^2 + 11x + 10 = 0$ 50. $4x^2 + 4x = 3$
 51. $(x + 3)^2 = 9$ 52. $2x^2 - 6x = 8$ 53. $2x^2 + x - 28 = 0$

Critical Thinking The graphs of each pair of functions intersect. Find their points of intersection without using a calculator. (*Hint: Solve as a system using substitution.*)

54. $y = x^2$ 55. $y = x^2 - 2$ 56. $y = -x^2 + x + 4$
 $y = -\frac{1}{2}x^2 + \frac{3}{2}x + 3$ $y = 3x^2 - 4x - 2$ $y = 2x^2 - 6$
 (-1, 1), (2, 4) (0, -2), (2, 2) $(-\frac{5}{3}, -\frac{4}{9}), (2, 2)$
57. Writing Explain how you found the intersections in Exercises 54–56. **See left.**

Open-Ended Write a quadratic equation with the given solutions. **58–61. See margin.**

58. 3 and 5 59. -3 and 2 60. -1 and -6 61. $\frac{1}{2}$ and $\frac{2}{3}$

- 62. Matrices** Find the possible values of x and y .

$$\begin{bmatrix} x & 2 \\ 3 & y \end{bmatrix}^2 = \begin{bmatrix} 22 & 10 \\ 15 & \blacksquare \end{bmatrix} \quad x = 4, y = 1 \text{ or } x = -4, y = 9$$

- 63. a.** Write the equation of a parabola with vertex $(-3, 5)$ passing through $(-4, 6)$.
b. Find the values of x when $y = 8$. **about -4.732, about -1.268**
64. The equation $x^2 - 10x + 24 = 0$ can be written in factored form as $(x - 4)(x - 6) = 0$. How can you use this fact to find the vertex of the graph of $y = x^2 - 10x + 24$? **See back of book.**

- 65. Physics** Suppose you throw a ball straight up from the ground with a velocity of 80 ft/s. As the ball moves upward, gravity slows it. Eventually the ball begins to fall back to the ground. The height h of the ball after t seconds in the air is given by the quadratic function $h(t) = -16t^2 + 80t$.
a. How high does the ball go? **100 ft**
b. For how many seconds is the ball in the air before it hits the ground? **5 s**
66. a. Let $a > 0$. Use algebraic or arithmetic ideas to explain why the lowest point on the graph of $y = a(x - h)^2 + k$ must occur when $x = h$.
b. Suppose that the function in part (a) is $y = a(x - h)^3 + k$. Is your reasoning still valid? Explain. **a–b. See back of book.**

Lesson Quiz 5-5

Solve each equation by factoring.

1. $4x^2 - 17x - 15 = 0$ **$-\frac{3}{4}, 5$**
 2. $10x^2 + 19x + 6 = 0$ **$-\frac{3}{2}, -\frac{2}{5}$**
 3. Solve $3x^2 = 4800$ by using square roots. **± 40**
 4. Use a graphing calculator to solve $2x^2 + 5x - 9 = 0$. Round the solutions to the nearest hundredth. **-3.71, 1.21**

Alternative Assessment

Give students a quadratic equation to solve and ask them to solve it both by factoring and by graphing with a graphing calculator. Ask students to write a short paragraph explaining which method they prefer, and why. Then ask students to explain why the graphing method might be easier for some problems, while factoring might be easier for others.

49. -10, -1
 50. -1.5, 0.5
 51. -6, 0
 52. -1, 4
 53. -4, 3.5
58–61. Answers may vary. Samples are given.
 58. $x^2 - 8x + 15 = 0$
 59. $x^2 + x - 6 = 0$
 60. $x^2 + 7x + 6 = 0$
 61. $6x^2 - 7x + 2 = 0$

39. $-\frac{1}{2}, 3$ 44. -3.25, 0.92
 40. -8.69, 0.69 45. -3.58, 3.58
 41. $-\frac{3}{2}, -\frac{2}{3}$ 46. -4, 0
 42. $-4, \frac{5}{2}$ 47. 1, 7
 43. -5.89, 5.89 48. -5, 3

$\frac{10\sqrt{10}}{3}$ or about 10.54 s

-10, 4

3, 8

-3, 3

