Exercise Set 1.5

Practice Exercises

Solve each equation in Exercises 1–14 by factoring.

1. $x^2 - 3x - 10 = 0$
2. $x^2 - 13x + 36 = 0$
3. $x^2 = 8x - 15$
4. $x^2 = -11x - 10$
5. $6x^2 + 11x - 10 = 0$
6. $9x^2 + 9x + 2 = 0$
7. $3x^2 - 2x = 8$
8. $4x^2 - 13x = -3$
9. $3x^2 + 12x = 0$
10. $5x^2 - 20x = 0$
11. $2x(x - 3) = 5x^2 - 7x$
12. $16x(x - 2) = 8x - 25$
13. $7 - 7x = (3x + 2)(x - 1)$
14. $10x - 1 = (2x + 1)^2$

Solve each equation in Exercises 15–34 by the square root property.

15. $3x^2 = 27$
16. $5x^2 = 45$
17. $5x^2 + 1 = 51$
18. $3x^2 - 1 = 47$
19. $2x^2 - 5 = -55$
20. $2x^2 - 7 = -15$
21. $(x + 2)^2 = 25$
22. $(x - 3)^2 = 36$
23. $3(x - 4)^2 = 15$
24. $3(x + 4)^2 = 21$
25. $(x + 3)^2 = -16$
26. $(x - 1)^2 = -9$
27. $(x - 3)^2 = -5$
28. $(x + 2)^2 = -7$
29. $(3x + 2)^2 = 9$
30. $(4x - 1)^2 = 16$
31. $(5x - 1)^2 = 7$
32. $(8x - 3)^2 = 5$
33. $(3x - 4)^2 = 8$
34. $(2x + 8)^2 = 27$

In Exercises 35–46, determine the constant that should be added to the binomial so that it becomes a perfect square trinomial. Then write and factor the trinomial.

35. $x^2 + 12x$
36. $x^2 + 16x$
37. $x^2 - 10x$
38. $x^2 - 14x$
39. $x^2 + 3x$
40. $x^2 + 5x$
41. $x^2 - 7x$
42. $x^2 - 9x$
43. $x^2 - \frac{2}{3}x$
44. $x^2 + \frac{4}{5}x$
45. $x^2 - \frac{1}{3}x$
46. $x^2 - \frac{1}{4}x$

Solve each equation in Exercises 47–64 by completing the square.

47. $x^2 + 6x = 7$
48. $x^2 + 6x = -8$
49. $x^2 - 2x = 2$
50. $x^2 + 4x = 12$
51. $x^2 - 6x - 11 = 0$
52. $x^2 - 2x - 5 = 0$
53. $x^2 + 4x + 1 = 0$
54. $x^2 + 6x - 5 = 0$
55. $x^2 - 5x + 6 = 0$
56. $x^2 + 7x - 8 = 0$
57. $x^2 + 3x - 1 = 0$
58. $x^2 - 3x - 5 = 0$
59. $2x^2 - 7x + 3 = 0$
60. $2x^2 + 5x - 3 = 0$
61. $4x^2 - 4x - 1 = 0$
62. $2x^2 - 4x - 1 = 0$
63. $3x^2 - 2x - 2 = 0$
64. $3x^2 - 5x - 10 = 0$

Solve each equation in Exercises 65–74 using the quadratic formula.

65. $x^2 + 8x + 15 = 0$
66. $x^2 + 8x + 12 = 0$
67. $x^2 + 5x + 3 = 0$
68. $x^2 + 5x + 2 = 0$
69. $3x^2 - 3x - 4 = 0$
70. $5x^2 + x - 2 = 0$
71. $4x^2 = 2x + 7$
72. $3x^2 = 6x - 1$
73. $x^2 - 6x + 10 = 0$
74. $x^2 - 2x + 17 = 0$

In Exercises 75–82, compute the discriminant. Then determine the number and type of solutions for the given equation.

75. $x^2 - 4x - 5 = 0$
76. $4x^2 - 2x + 3 = 0$
77. $2x^2 - 11x + 3 = 0$
78. $2x^2 + 11x - 6 = 0$
79. $x^2 - 2x + 1 = 0$
80. $3x^2 = 2x - 1$
81. $x^2 - 3x - 7 = 0$
82. $3x^2 + 4x - 2 = 0$

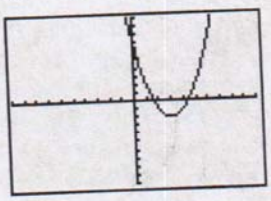
Solve each equation in Exercises 83–108 by the method of your choice.

83. $2x^2 - x = 1$
84. $3x^2 - 4x = 4$
85. $5x^2 + 2 = 11x$
86. $5x^2 = 6 - 13x$
87. $3x^2 = 60$
88. $2x^2 = 250$
89. $x^2 - 2x = 1$
90. $2x^2 + 3x = 1$
91. $(2x + 3)(x + 4) = 1$
92. $(2x - 5)(x + 1) = 2$
93. $(3x - 4)^2 = 16$
94. $(2x + 7)^2 = 25$
95. $3x^2 - 12x + 12 = 0$
96. $9 - 6x + x^2 = 0$
97. $4x^2 - 16 = 0$
98. $3x^2 - 27 = 0$
99. $x^2 - 6x + 13 = 0$
100. $x^2 - 4x + 29 = 0$
101. $x^2 = 4x - 7$
102. $5x^2 = 2x - 3$
103. $2x^2 - 7x = 0$
104. $2x^2 + 5x = 3$
105. $\frac{1}{x} + \frac{1}{x + 2} = \frac{1}{3}$
106. $\frac{1}{x} + \frac{1}{x + 3} = \frac{1}{4}$
107. $\frac{2x}{x - 3} + \frac{6}{x + 3} = -\frac{28}{x^2 - 9}$
108. $\frac{3}{x - 3} + \frac{5}{x - 4} = \frac{x^2 - 20}{x^2 - 7x + 12}$

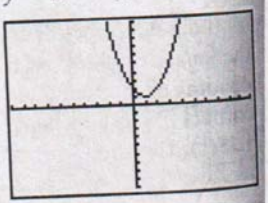
In Exercises 109–114, find the x-intercept(s) of the graph of each equation. Use the x-intercepts to match the equation with its graph. The graphs are shown in $[-10, 10, 1]$ by $[-10, 10, 1]$ viewing rectangles and labeled (a) through (f).

109. $y = x^2 - 4x - 5$
110. $y = x^2 - 6x + 7$
111. $y = -(x + 1)^2 + 4$
112. $y = -(x + 3)^2 + 1$
113. $y = x^2 - 2x + 2$
114. $y = x^2 + 6x + 9$

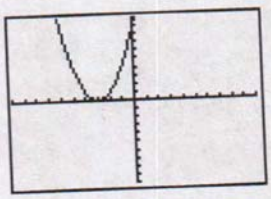
a.



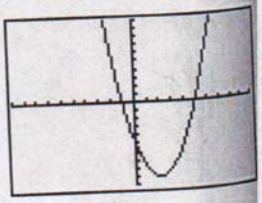
b.



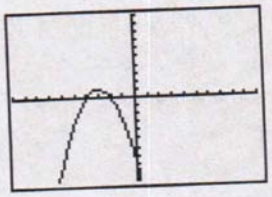
c.



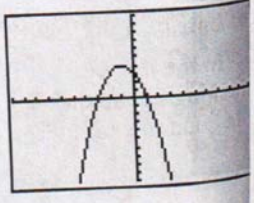
d.



e.



f.



In Exercises 115–122, find all values of x satisfying the given conditions.

115. $y = 2x^2 - 3x$ and $y = 2$.

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

117. $y_1 = x - 1$, $y_2 = x + 4$, and $y_1 y_2 = 14$.

118. $y_1 = x - 3$, $y_2 = x + 8$, and $y_1 y_2 = -30$.

119. $y_1 = \dfrac{2x}{x+2}$, $y_2 = \dfrac{3}{x+4}$, and $y_1 + y_2 = 1$.

120. $y_1 = \dfrac{3}{x-1}$, $y_2 = \dfrac{8}{x}$, and $y_1 + y_2 = 3$.

121. $y_1 = 2x^2 + 5x - 4$, $y_2 = -x^2 + 15x - 10$, and $y_1 - y_2 = 0$.

122. $y_1 = -x^2 + 4x - 2$, $y_2 = -3x^2 + x - 1$, and $y_1 - y_2 = 0$.

Practice Plus

In Exercises 123–124, list all numbers that must be excluded from the domain of each rational expression.

123. $\dfrac{3}{2x^2 + 4x - 9}$ **124.** $\dfrac{7}{2x^2 - 8x + 5}$

125. When the sum of 6 and twice a positive number is subtracted from the square of the number, 0 results. Find the number.

126. When the sum of 1 and twice a negative number is subtracted from twice the square of the number, 0 results. Find the number.

In Exercises 127–130, solve each equation by the method of your choice.

127. $\dfrac{1}{x^2 - 3x + 2} = \dfrac{1}{x+2} + \dfrac{5}{x^2 - 4}$

128. $\dfrac{x-1}{x-2} + \dfrac{x}{x-3} = \dfrac{1}{x^2 - 5x + 6}$

129. $\sqrt{2}x^2 + 3x - 2\sqrt{2} = 0$

130. $\sqrt{3}x^2 + 6x + 7\sqrt{3} = 0$

Application Exercises

In a round-robin chess tournament, each player is paired with every other player once. The formula

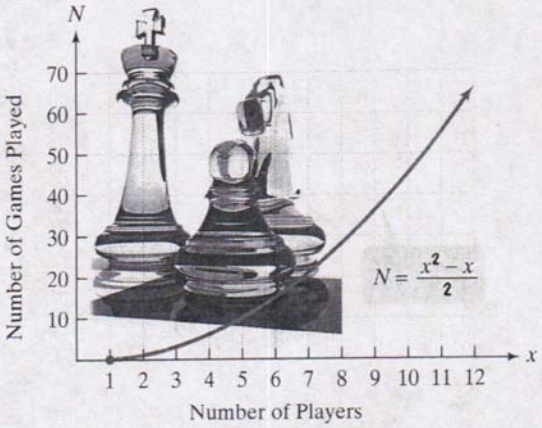
$$N = \frac{x^2 - x}{2}$$

models the number of chess games, N, that must be played in a round-robin tournament with x chess players. Use this formula to solve Exercises 131–132.

131. In a round-robin chess tournament, 21 games were played. How many players were entered in the tournament?

132. In a round-robin chess tournament, 36 games were played. How many players were entered in the tournament?

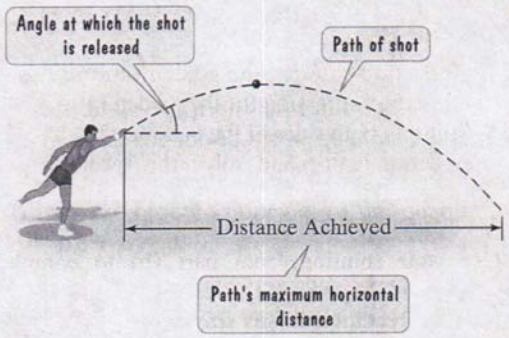
The graph of the formula in Exercises 131–132 is shown. Use the graph to solve Exercises 133–134.



133. Identify your solution to Exercise 131 as a point on the graph.

134. Identify your solution to Exercise 132 as a point on the graph.

Throwing events in track and field include the shot put, the discus throw, the hammer throw, and the javelin throw. The distance that an athlete can achieve depends on the initial velocity of the object thrown and the angle above the horizontal at which the object leaves the hand.

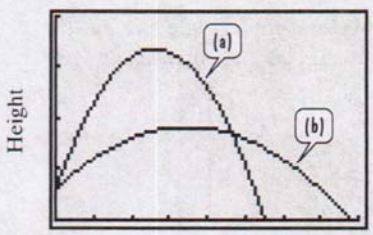


In Exercises 135–136, an athlete whose event is the shot put releases the shot with the same initial velocity, but at different angles.

135. When the shot is released at an angle of 35°, its path can be modeled by the formula

$$y = -0.01x^2 + 0.7x + 6.1,$$

in which x is the shot's horizontal distance, in feet, and y is its height, in feet. This formula is shown by one of the graphs, (a) or (b), in the figure. Use the formula to determine the shot's maximum distance. Use a calculator and round to the nearest tenth of a foot. Which graph, (a) or (b), shows the shot's path?



Horizontal Distance
[0, 80, 10] by [0, 40, 10]