Evaluate the determinant of the matrix. (Lesson 4.3)

19. $\begin{bmatrix} 4 & -3 \\ 7 & 2 \end{bmatrix}$ -13

20. $\begin{bmatrix} 0 & 6 \\ 1 & -4 \end{bmatrix}$ -6

21. $\begin{bmatrix} -3 & 5 \\ 9 & 2 \end{bmatrix}$ -51

22. $\begin{bmatrix} 6 & 3 & 1 \\ 0 & 0 & -1 \\ 13 & 9 & 12 \end{bmatrix}$ 15

23. $\begin{bmatrix} 21 & 7 & 2 \\ -6 & 10 & 9 \\ 1 & 0 & 3 \end{bmatrix}$ 799

24. $\begin{bmatrix} -9 & 5 & -6 \\ 0 & 3 & 10 \\ -10 & 17 & 4 \end{bmatrix}$ 742

Use Cramer's rule to solve the linear system. (Lesson 4.3)

25. $3x + y = 3$ $(2, -3)$
$4x + 5y = -7$

26. $4x + 5y = 30$ $(-15, 18)$
$-3x - 3y = -9$

27. $8x - 10y = -8$ $(-6, -4)$
$9x + 2y = -62$

28. $2x + z = 6$ $(1, 3, 4)$
$3x - 2y + 4z = 13$
$-y - 3z = -15$

29. $x + y + 2z = 0$ $(5, -1, -2)$
$2x - 6y + 5z = 6$
$-x + 3y - 7z = 6$

30. $3x + 4y + 2z = 12$ $\left(-7, 8, \frac{1}{2}\right)$
$-2x - 3y - 4z = -12$
$5x + 5y + 6z = 8$

Find the inverse of the matrix. (Lesson 4.4)

31. $\begin{bmatrix} 4 & 3 \\ 7 & 6 \end{bmatrix}$ See margin.

32. $\begin{bmatrix} 0 & 6 \\ 1 & -4 \end{bmatrix}$ $\begin{bmatrix} \frac{2}{3} & 1 \\ \frac{1}{6} & 0 \end{bmatrix}$

33. $\begin{bmatrix} -3 & 6 \\ 1 & 2 \end{bmatrix}$ $\begin{bmatrix} -\frac{1}{6} & \frac{1}{2} \\ \frac{1}{12} & \frac{1}{4} \end{bmatrix}$

34. $\begin{bmatrix} -1 & 7 \\ 2 & -5 \end{bmatrix}$ $\begin{bmatrix} \frac{5}{9} & \frac{7}{9} \\ \frac{2}{9} & \frac{1}{9} \end{bmatrix}$

35. $\begin{bmatrix} 1 & 2 \\ 4 & -8 \end{bmatrix}$ $\begin{bmatrix} \frac{1}{2} & \frac{1}{8} \\ \frac{1}{4} & \frac{-1}{16} \end{bmatrix}$

36. $\begin{bmatrix} 6 & 2 \\ -8 & 1 \end{bmatrix}$ $\begin{bmatrix} \frac{1}{22} & \frac{-1}{11} \\ \frac{4}{11} & \frac{3}{11} \end{bmatrix}$

37. $\begin{bmatrix} -9 & 7 \\ 4 & -3 \end{bmatrix}$ $\begin{bmatrix} 3 & 7 \\ 4 & 9 \end{bmatrix}$

38. $\begin{bmatrix} 3 & -1 \\ -2 & 9 \end{bmatrix}$ $\begin{bmatrix} \frac{9}{25} & \frac{1}{25} \\ \frac{2}{25} & \frac{3}{25} \end{bmatrix}$

Use an inverse matrix to solve the linear system. (Lesson 4.5)

39. $2x + 3y = 13$ $(5, 1)$
$x - 5y = 0$

40. $-4x - 3y = -2$
$2x + y = 2$ $(2, -2)$

41. $6x - 3y = -3$
$-4x + 7y = -3$
$(-1, -1)$

42. $5x + 2y = 8$ $(4, -6)$
$-2x - 9y = 46$

43. $3x - 8y = 16$ $(0, -2)$
$-2x + 5y = -10$

44. $-7x - 2y = -8$
$3x - 6y = 0$ $\left(1, \frac{1}{2}\right)$

45. $-5x - y = 2$
$10x + 3y = 1$ $\left(-\frac{7}{5}, 5\right)$

46. $-6x + 5y = -2$ $(2, 2)$
$4x - 3y = 2$

47. Use the given inverse of the coefficient matrix to solve the linear system. (Lesson 4.5)

$x + 2z = 5$
$-2x + 3y + 4z = -8$
$2x - y + 2z = 10$

$A^{-1} = \begin{bmatrix} 5 & -1 & -3 \\ 6 & -1 & -4 \\ -2 & 5 & 1.5 \end{bmatrix}$ $(3, -2, 1)$

CHAPTER 5

Graph the quadratic function. Label the vertex and axis of symmetry. (Lesson 5.1) 1–8. See margin.

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

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

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

4. $y = (x + 1)(x - 4)$

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

6. $y = 3(x + 4)(x - 1)$

7. $y = (x + 8)(x - 3)$

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

9. **SWIMMING** The drag force F (in pounds) of water on a swimmer can be modeled by $F = 1.35s^2$ where s is the swimmer's speed (in miles per hour). At what speed is the force minimized? (Lesson 5.1) 0 miles per hour

Factor the trinomial. If the trinomial cannot be factored, say so. (Lesson 5.2)

1. $x^2 + 8x + 15$
$(x + 5)(x + 3)$

11. $m^2 - 9m + 20$
$(m - 4)(m - 5)$

12. $3x^2 + 11x - 4$
$(3x - 1)(x + 4)$

13. $6x^2 + 5x - 6$
$(3x - 2)(2x + 3)$

14. $9a^2 - 56a + 12$
$(9a - 2)(a - 16)$

15. $4u^2 - 4u - 35$
$(2u + 5)(2u - 7)$

16. $n^2 - 49$
$(n + 7)(n - 7)$

17. $x^2 - 10x + 25$
$(x - 5)^2$

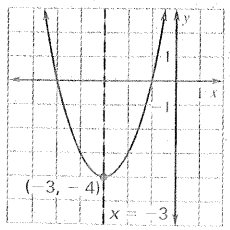
18. $16m^2 - 24m + 9$
$(4m - 3)^2$

19. $4x^2 - 2x - 20$
$2(2x - 5)(x + 2)$

20. $3p^2 + 15p - 42$
$3(p + 7)(p - 2)$

21. $6x^2 + 13x - 25$
cannot be factored

3.



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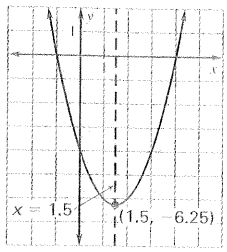

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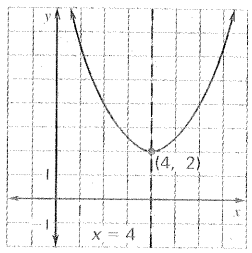

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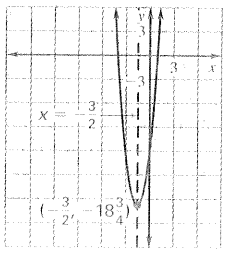

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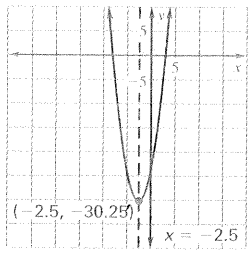

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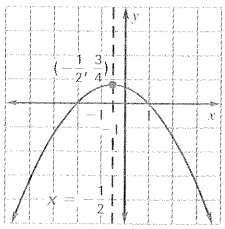
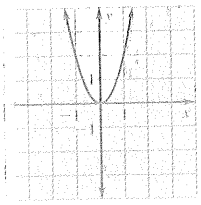
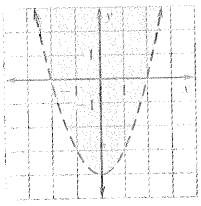


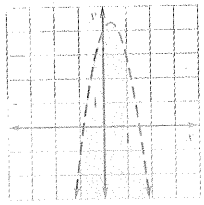
$1 + \frac{2\sqrt{6}}{3}, -1 - \frac{2\sqrt{6}}{3}$

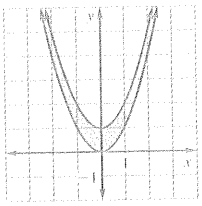
$\frac{3}{7} + \frac{\sqrt{61}}{7}i, \frac{3}{7} - \frac{\sqrt{61}}{7}i$

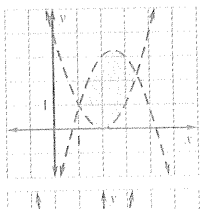
$\frac{1}{4} + \frac{\sqrt{41}}{4}, \frac{1}{4} - \frac{\sqrt{41}}{4}$

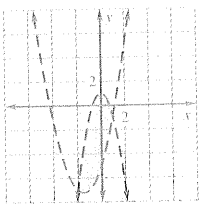












Solve the equation. (Lesson 5.2)

22. $x^2 + 10x + 21 = 0$ $-7, -3$

23. $2x^2 - 13x - 7 = 0$ $-\frac{1}{2}, 7$

24. $3x^2 - 24x - 27 = 0$ $9, -1$

25. $25m^2 - 20m + 4 = 0$ $\frac{2}{5}$

26. $x^2 - 8x = -15$ 3, 5

27. $8k^2 + 5k = 2k^2 + 4$ $-\frac{4}{3}, \frac{1}{2}$

28. $10x^2 - 3x = -2x^2 + 36$ 1.61, 1.86

29. $2(q^2 - 20) + 17q = -10q^2$ $-\frac{8}{3}, \frac{5}{4}$

Write the quadratic function in intercept form and give the function's zeros. (Lesson 5.2)

30. $y = x^2 + 10x + 9$ $y = (x + 1)(x + 9)$; $-1, -9$

31. $y = x^2 - 5x$ $y = x(x - 5)$; 0, 5

32. $y = 2x^2 + 3x - 2$ $y = (2x - 1)(x + 2)$; $\frac{1}{2}, -2$

33. $y = 6x^2 - 24$ $y = 6(x + 2)(x - 2)$; 2, -2

34. $y = 4x^2 - 12x + 8$ $y = 4(x - 1)(x - 2)$; 1, 2

35. $y = 5x^2 - 13x + 6$ $y = (5x - 3)(x - 2)$; $\frac{3}{5}$, 2

36. $y = 4x^2 + 22x + 24$ $y = 2(2x + 3)(x + 4)$; $-\frac{3}{2}, -4$

37. $y = 7x^2 - 63$ $y = 7(x + 3)(x - 3)$; 3, -3

Simplify the expression. (Lesson 5.3)

38. $\sqrt{32}$ $4\sqrt{2}$

39. $\sqrt{125}$ $5\sqrt{5}$

40. $3\sqrt{27} \cdot \sqrt{3}$ 27

41. $\sqrt{243}$ $9\sqrt{3}$

42. $\sqrt{15} \cdot \sqrt{3}$ $3\sqrt{5}$

43. $\sqrt{\frac{81}{125}}$ $\frac{9\sqrt{5}}{25}$

44. $6\sqrt{5} \cdot \sqrt{5}$ 30

45. $\sqrt{\frac{16}{25}}$ $\frac{4}{5}$

Solve the equation. (Lesson 5.3)

46. $x^2 = 144$ 12, -12

47. $x^2 = 160$ $4\sqrt{10}$, $-4\sqrt{10}$

48. $2x^2 = 400$ $10\sqrt{2}$, $-10\sqrt{2}$

49. $-4(x + 2)^2 = -20$ $\sqrt{5} - 2, -\sqrt{5} - 2$

50. $\frac{x^2}{9} - 1 = 5$ $3\sqrt{6}$, $-3\sqrt{6}$

51. $7x^2 = 175$ 5, -5

52. $x^2 - 100 = -82$ $3\sqrt{2}$, $-3\sqrt{2}$

53. $\frac{1}{3}(x - 4)^2 = 3$ 7, 1

Solve the equation. (Lesson 5.4)

54. $x^2 = -16$ $4i$, $-4i$

55. $x^2 = -10$ $i\sqrt{10}$, $-i\sqrt{10}$

56. $3x^2 = -27$ $3i$, $-3i$

57. $5x^2 = -125$ $5i$, $-5i$

58. $(y - 3)^2 = -49$ $3 + 7i, 3 - 7i$

59. $6x^2 = -216$ $6i$, $-6i$

60. $4(x + 5)^2 = -8$ $-5 + i\sqrt{2}$, $-5 - i\sqrt{2}$

61. $-\frac{1}{4}(r + 1)^2 = 5$ $-1 + 2i\sqrt{5}, -1 - 2i\sqrt{5}$

Write the expression as a complex number in standard form. (Lesson 5.4)

62. $(3 + 5i) + (2 + i)$ $5 + 6i$

63. $(-6 + 4i) + (2 - 7i)$ $-4 - 3i$

64. $(4 + 3i)^2$ $7 + 24i$

65. $(15 - 7i) - (15 - 7i)$ 0

66. $i(5 + i)$ $-1 + 5i$

67. $-2i(3 - 2i)$ $-4 - 6i$

68. $(9 - 2i)(9 + 2i)$ 85

69. $(9 - 5i) - (-2 + 6i)$ $7 - 11i$

70. $(10 - 7i)^2$ $51 - 140i$

71. $\frac{3}{5 + i}$ $\frac{15}{26} - \frac{3}{26}i$

72. $\frac{2i}{4 - i}$ $-\frac{2}{17} + \frac{8}{17}i$

73. $\frac{1 - i}{1 + i}$ $-i$

Solve the equation by completing the square. (Lesson 5.5)

74. $x^2 - 6x = 7$ 7, -1

75. $x^2 - 4x + 8 = 0$ $2 + 2i, 2 - 2i$

76. $x^2 - 10x = 1$ $5 + 3\sqrt{6}, 5 - 2\sqrt{6}$

77. $m^2 + 2.6m - 3 = 0$ 0.866, -3.47

78. $2n^2 - 5n = 7$ $\frac{7}{2}$, -1

79. $3n^2 - 4n = 4$ $-\frac{2}{3}$, 2

80. $3y^2 + 2y = 5 - 4y$ See margin.

81. $5n^2 + 6n = 8$ $\frac{4}{5}$, -2

82. VEGETABLE GARDEN You are planning to create a vegetable garden behind your house. Your house will be one side of the rectangular garden, and the garden will have a fence on its other sides. You bought 40 feet of fencing and enough mulch to cover 140 square feet. If the back of the house is 30 feet wide, what should the garden's dimensions be? (Lesson 5.5) about 15.5 feet long and 9 feet wide

Use the quadratic formula to solve the equation. (Lesson 5.6)

83. $4x^2 + x = 3$ $\frac{3}{4}$, -1

84. $x^2 + 10x + 25 = 0$ -5

85. $x^2 + 3x - 8 = 0$ $-\frac{3}{2} + \frac{\sqrt{41}}{2}, -\frac{3}{2} -$

86. $x^2 - 4x + 5 = 0$ $2 + i, 2 - i$

87. $7m^2 - 6m + 10 = 0$ See margin.

88. $2(m + 1)^2 = 3m + 7$ See margin.

Find the discriminant of the quadratic equation and give the number and type of solutions of the equation. (Lesson 5.6)

89. $x^2 + 7x + 12 = 0$ 1; 2; real

90. $x^2 - 8x + 16 = 0$ 0; 1; real

91. $5m^2 + 3m + 10 = 0$ -191; 2; comple

92. $x^2 + 5x - 6 = 0$ 49; 2; real

93. $2x^2 - 4x + 7 = 0$ -40; 2; complex

94. $4x^2 + 3x - 15 = 0$ 249; 2; real

Graph the inequality or system of inequalities. (Lesson 5.7) 95–100. See margin.

95. $y \leq 2x^2$

96. $y > x^2 - 4$

97. $y < -3x^2 + 2x + 4$

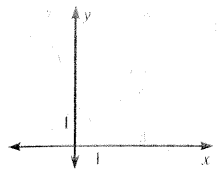
98. $y \leq x^2 + 1$
$y \geq x^2$

99. $y > x^2 - 4x + 4$
$y < -x^2 + 5x - 3$

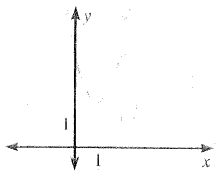
100. $y > x^2 + 3x - 5$
$y < -2x^2 + 1$

Write a quadratic function in vertex form for the parabola whose graph has the given vertex and passes through the given point. (Lesson 5.8)

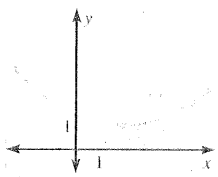
101.



102.



103.



104. vertex: $(3, 0)$
point: $(2, 1)$
$y = (x - 3)^2$

105. vertex: $(-3, -5)$
point: $(1, 27)$
$y = 2(x + 3)^2 - 5$

106. vertex: $(-1, -4)$
point: $(-2, -6)$
$y = -2(x + 1)^2 - 4$

Write a quadratic function in intercept form whose graph has the given *x*-intercepts and passes through the given point. (Lesson 5.8)

107. *x*-intercepts: 2, 6
point: $(5, -3)$
$y = (x - 2)(x - 6)$

108. *x*-intercepts: $-1, 3$
point: $(3, 6)$
$y = -(x + 1)(x - 3)$

109. *x*-intercepts: 4, 0
point: $(1, -6)$
$y = 2x(x - 4)$

110. *x*-intercepts: $-2, 3$
point: $(2, 1)$
$y = -\frac{1}{4}(x + 2)(x - 3)$

111. *x*-intercepts: 1, 2
point: $(2, 0)$
$y = \frac{3}{4}(x - 1)(x - 2)$

112. *x*-intercepts: $-1, 4$
point: $(0, -1)$
$y = \frac{3}{2}(x + 1)(x - 4)$

113. *x*-intercepts: 5, -2
point: $(2, 2)$
$y = -\frac{1}{6}(x - 5)(x + 2)$

114. *x*-intercepts: $-3, -3$
point: $(1, 48)$
$y = 3(x + 3)(x + 3)$

CHAPTER 6

Evaluate the expression. Tell which properties of exponents you used. (Lesson 6.1)

1. $5^2 \cdot 5^2$ 625; product of powers

2. $(-4)^3(-4)$ 256; product of powers

3. $(2^3)^3$ 512; power of a power

4. 6^{-2} $\frac{1}{36}$; negative exponent

5. $\left(\frac{4}{5}\right)^2$ $\frac{16}{25}$; power of a quotient

6. $\left(\frac{3}{7}\right)^{-2}$ See margin.

7. $8^0 \cdot 8^{-3}$ See margin.

8. $\frac{3^{-2}}{3^{-4}}$ 9; Sample answer: quotient of powers

9. $\left(\frac{1}{6}\right)^3\left(\frac{1}{6}\right)^3$ See margin.

10. $\left(\left(\frac{1}{3}\right)^2\right)^{-3}$ See margin.

11. $\frac{6^3}{4^0 \cdot 6^2}$ 6; zero exponent, quotient of powers

12. $5^5 \cdot 5^0 \cdot 5^{-3}$ See margin.

Simplify the expression. Tell which properties of exponents you used. (Lesson 6.1) 13–24, See margin for properties.

13. $(32x^2)^4$ $1,048,576x^8$

14. $(x^2y^2)^{-3}$ $\frac{1}{x^6y^6}$

15. $\frac{x^8}{x^5}$ x^3

16. $\frac{4x^4y^7}{8x^5y^3}$ $\frac{y^4}{2x}$

17. $(6x^3y^4)^{-2}$ $\frac{1}{36x^6y^8}$

18. $-4(x^{-5}y^2)^2$ $-\frac{4y^4}{x^{10}}$

19. $(-3x^9y^3)^{-7}$ $-\frac{1}{2187x^{63}y^{21}}$

20. $(6x^{-3}y^{-1})^{-8}$ $\frac{x^{24}y^8}{1,679,616}$

21. $(8(x^3y^4)^2)^{-2}$ $\frac{1}{64x^{12}y^{16}}$

22. $\frac{2x^{-3}y^{-5}}{3x^{-6}y^{-3}}$ $\frac{2x^3}{3y^2}$

23. $\frac{x^{10}}{3y^4} \cdot \frac{9x^2y^2}{x^4y^3}$ $\frac{3x^8}{y^4}$

24. $\frac{15xy^4}{8x^3y^0} \cdot \frac{16x^5y^2}{5y^4}$ $6x^3y^2$

Use synthetic division to evaluate the polynomial function for the given value of *x*. (Lesson 6.2)

25. $f(x) = 2x^3 + 3x^2 - 5x + 1; x = 2$ 19

26. $f(x) = 10x^3 - 5x^2 + 4; x = -1$ -11

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

28. $f(x) = -x^4 + 7x - 12; x = 3$ -72

Graph the polynomial function. (Lesson 6.2) 29–34. See margin.

29. $f(x) = x^3$

30. $f(x) = x^4 + 1$

31. $f(x) = 3 - x^3$

32. $f(x) = x^4 - 3x$

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

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