RESPUESTAS a ejercicios seleccionados y exámenes de capítulo

PRÓLOGO ■ PÁGINA P4

1. No puede ir con suficiente rapidez. **2.** 40% de descuento **3.** 427, $3n + 1$ **4.** 57 min **5.** No, no necesariamente **6.** La misma cantidad **7.** 2π **8.** El polo norte es uno de tales puntos; hay un número infinito de otros cerca del polo sur.

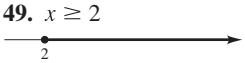
CAPÍTULO 1

SECCIÓN 1.1 ■ PÁGINA 10

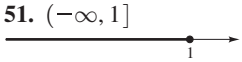
1. Las respuestas pueden variar. **(a)** 2 **(b)** -3 **(c)** $\frac{3}{2}$ **(d)** $\sqrt{2}$
2. (a) ba; Conmutativa **(b)** $(a + b) + c$; Asociativa
(c) $ab + ac$; Distributiva **3.** $\{x \mid 2 < x < 7\}$; $(2, 7)$
4. valor absoluto; positivo **5. (a)** 50 **(b)** 0, -10, 50
(c) 0, -10, 50, $\frac{22}{7}$, 0.538, $1.2\overline{3}$, $-\frac{1}{3}$ **(d)** $\sqrt{7}$, $\sqrt[3]{2}$
7. Propiedad Conmutativa para la adición
9. Propiedad Asociativa para la adición **11.** Propiedad Distributiva
13. Propiedad Conmutativa para la multiplicación
15. $3 + x$ **17.** $4A + 4B$ **19.** $3x + 3y$ **21.** $8m$
23. $-5x + 10y$ **25. (a)** $\frac{17}{30}$ **(b)** $\frac{9}{20}$ **27. (a)** 3 **(b)** $\frac{25}{72}$
29. (a) $\frac{8}{3}$ **(b)** 6 **31. (a)** $<$ **(b)** $>$ **(c)** $=$ **33. (a)** Falso
(b) Verdadero **35. (a)** Falso **(b)** Verdadero **37. (a)** $x > 0$
(b) $t < 4$ **(c)** $a \geq \pi$ **(d)** $-5 < x < \frac{1}{3}$ **(e)** $|p - 3| \leq 5$
39. (a) $\{1, 2, 3, 4, 5, 6, 7, 8\}$ **(b)** $\{2, 4, 6\}$
41. (a) $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ **(b)** $\{7\}$
43. (a) $\{x \mid x \leq 5\}$ **(b)** $\{x \mid -1 < x < 4\}$
45. $-3 < x < 0$

47. $2 \leq x < 8$

49. $x \geq 2$



51. $(-\infty, 1]$



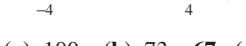
53. $(-2, 1]$

55. $(-1, \infty)$

57. (a) $[-3, 5]$ **(b)** $(-3, 5]$
59.

61.

63.



65. (a) 100 **(b)** 73 **67. (a)** 2 **(b)** -1 **69. (a)** 12 **(b)** 5
71. 5 **73. (a)** 15 **(b)** 24 **(c)** $\frac{67}{40}$ **75. (a)** $\frac{7}{9}$ **(b)** $\frac{13}{45}$ **(c)** $\frac{19}{33}$
77. Propiedad Distributiva **79. (a)** Sí, no **(b)** 6 pies

SECCIÓN 1.2 ■ PÁGINA 21

1. (a) 5^6 **(b)** base, exponente **2. (a)** sume, 3^9 **(b)** reste, 3^3
3. (a) $5^{1/3}$ **(b)** $\sqrt{5}$ **(c)** No **4.** $(4^{1/2})^3 = 8, (4^3)^{1/2} = 8$
5. $\frac{1}{\sqrt{3}} = \frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$ **6.** $\frac{2}{3}$ **7.** $5^{-1/2}$ **9.** $\sqrt[3]{4^2}$ **11.** $5^{3/5}$
13. $\sqrt[5]{a^2}$ **15. (a)** -9 **(b)** 9 **(c)** $\frac{1}{9}$ **17. (a)** $\frac{1}{2}$ **(b)** $\frac{1}{8}$
(c) 16 **19. (a)** 4 **(b)** 2 **(c)** $\frac{1}{2}$ **21. (a)** $\frac{2}{3}$ **(b)** 4 **(c)** $\frac{1}{2}$
23. (a) $\frac{3}{2}$ **(b)** 4 **(c)** -4 **25.** 5 **27.** 14 **29.** $7\sqrt{2}$
31. $3\sqrt[5]{3}$ **33.** $(x^2 + 4)\sqrt{x}$ **35. (a)** x^{10} **(b)** $12y^7$ **(c)** $\frac{1}{x^4}$
37. (a) y^3 **(b)** $\frac{1}{x^4}$ **(c)** a^6 **39. (a)** a^{18} **(b)** $\frac{a^6}{64}$ **(c)** $\frac{1}{24z^4}$
41. (a) $8x^7y^5$ **(b)** $4a^5z^5$ **43. (a)** $405x^{10}y^{23}$ **(b)** $500a^{12}b^{19}$
45. (a) $\frac{3y^2}{z}$ **(b)** $\frac{y^2z^9}{x^2}$ **47. (a)** $\frac{a^{19}b}{c^9}$ **(b)** $\frac{v^{10}}{u^{11}}$
49. (a) $\frac{4a^8}{b^9}$ (b) $\frac{125}{x^6y^3}$ **51. (a)** $\frac{b^3}{3a}$ **(b)** $\frac{s^3}{q^7r^4}$ **53.** $|x|$
55. $2x^2$ **57.** $2ab\sqrt[6]{b}$ **59.** $2|x|$ **61. (a)** x^2 **(b)** y^2
63. (a) $w^{5/3}$ **(b)** $4s^{9/2}$ **65. (a)** $4a^4b$ **(b)** $8a^9b^{12}$
67. (a) $4st^4$ **(b)** 4 **69. (a)** $\frac{1}{x}$ **(b)** $\frac{8y^8}{x^2}$ **71. (a)** $y^{3/2}$
(b) $10x^{7/12}$ **73. (a)** $2st^{11/6}$ **(b)** x **75. (a)** $y^{1/2}$ **(b)** $\frac{4u}{v^2}$
77. (a) 6.93×10^7 **(b)** 7.2×10^{12} **(c)** 2.8536×10^{-5}
(d) 1.213×10^{-4} **79. (a)** 319,000 **(b)** 272,100,000
(c) 0.00000002670 **(d)** 0.000000009999 **81. (a)** 5.9×10^{12} mi
(b) 4×10^{-13} cm **(c)** 3.3×10^{19} moléculas
83. 1.3×10^{-20} **85.** 1.429×10^{19} **87.** 7.4×10^{-14}
89. (a) $\frac{\sqrt{10}}{10}$ **(b)** $\frac{\sqrt{2x}}{x}$ **(c)** $\frac{\sqrt{3x}}{3}$
91. (a) $\frac{2\sqrt[3]{x^2}}{x}$ **(b)** $\frac{\sqrt[4]{y}}{y}$ **(c)** $\frac{xy^{3/5}}{y}$
93. (a) Negativo **(b)** Positivo **(c)** Negativo **(d)** Negativo
(e) Positivo **(f)** Negativo **95.** 2.5×10^{13} mi **97.** 1.3×10^{21} L
99. 4.03×10^{27} moléculas **101. (a)** 28 mi/h **(b)** 167 pies

SECCIÓN 1.3 ■ PÁGINA 32

1. 3; $2x^5$, $6x^4$, $4x^3$; $2x^3$, $2x^3(x^2 + 3x + 2)$
2. 10, 7; 2, 5; $(x + 2)(x + 5)$
3. $A^2 + 2AB + B^2$; $4x^2 + 12x + 9$ **4.** $A^2 - B^2$; $25 - x^2$

5. $(A + B)(A - B)$; $(2x - 5)(2x + 5)$ **6.** $(A + B)^2$; $(x + 5)^2$
7. Trinomio; x^2, $-3x$, 7; 2 **9.** Monomio; -8; 0
11. Cuatro términos; $-x^4$, x^3, $-x^2$, x; 4 **13.** $7x + 5$
15. $5x^2 - 2x - 4$ **17.** $x^3 + 3x^2 - 6x + 11$ **19.** $9x + 103$
21. $-t^4 + t^3 - t^2 - 10t + 5$ **23.** $21t^2 - 26t + 8$
25. $6x^2 + 7x - 5$ **27.** $2x^2 + 5xy - 3y^2$ **29.** $9x^2 + 24x + 16$
31. $4u^2 + 4uv + v^2$ **33.** $4x^2 + 12xy + 9y^2$ **35.** $x^2 - 25$
37. $9x^2 - 16$ **39.** $x - 4$ **41.** $y^3 + 6y^2 + 12y + 8$
43. $-8r^3 + 12r^2 - 6r + 1$ **45.** $x^3 + 4x^2 + 7x + 6$
47. $2x^3 - 7x^2 + 7x - 5$ **49.** $x\sqrt{x} - x$ **51.** $y^2 + y$
53. $x^4 - a^4$ **55.** $a - b^2$ **57.** $-x^4 + x^2 - 2x + 1$
59. $4x^2 + 4xy + y^2 - 9$ **61.** $2x(-x^2 + 8)$ **63.** $(y - 6)(y + 9)$
65. $xy(2x - 6y + 3)$ **67.** $(x - 1)(x + 3)$ **69.** $(2x - 5)(4x + 3)$
71. $(3x - 1)(x - 5)$ **73.** $(3x + 4)(3x + 8)$ **75.** $(3a - 4)(3a + 4)$
77. $(3x + y)(9x^2 - 3xy + y^2)$ **79.** $(2s - 5t)(4s^2 + 10st + 25t^2)$
81. $(x + 6)^2$ **83.** $(x + 4)(x^2 + 1)$ **85.** $(2x + 1)(x^2 - 3)$
87. $(x + 1)(x^2 + 1)$ **89.** $\sqrt{x}(x - 1)(x + 1)$ **91.** $x^{-3/2}(1 + x)^2$
93. $(x^2 + 1)^{-1/2}(x^2 + 3)$ **95.** $6x(2x^2 + 3)$ **97.** $(x - 4)(x + 2)$
99. $(2x + 3)(x + 1)$ **101.** $9(x - 5)(x + 1)$ **103.** $(7 - 2y)(7 + 2y)$
105. $(t - 3)^2$ **107.** $(2x + y)^2$ **109.** $4ab$
111. $(x - 1)(x + 1)(x - 3)(x + 3)$
113. $(2x - 5)(4x^2 + 10x + 25)$ **115.** $x(x + 1)^2$
117. $x^2y^3(x + y)(x - y)$ **119.** $(x + 2)(2x^2 + 1)$
121. $3(x - 1)(x + 2)$ **123.** $(a - 1)(a + 1)(a - 2)(a + 2)$
125. $2(x^2 + 4)^4(x - 2)^3(7x^2 - 10x + 8)$
127. $(x^2 + 3)^{-4/3}(\frac{1}{3}x^2 + 3)$
129. **(d)** $(a + b + c)(a + b - c)(a - b + c)(b - a + c)$

SECCIÓN 1.4 ■ PÁGINA 41

1. (a), (c) **2.** numerador; denominador; $\dfrac{x + 1}{x + 3}$

3. numeradores; denominadores; $\dfrac{2x}{x^2 + 4x + 3}$

4. **(a)** 3 **(b)** $x(x + 1)^2$ **(c)** $\dfrac{-2x^2 + 1}{x(x + 1)^2}$

5. $\mathbb{R}$ **7.** $x \neq 4$ **9.** $x \geq -3$ **11.** $\{x \mid x \neq -1, 2\}$

13. $\dfrac{x + 2}{2(x - 1)}$ **15.** $\dfrac{1}{x + 2}$ **17.** $\dfrac{x + 2}{x + 1}$ **19.** $\dfrac{y}{y - 1}$

21. $\dfrac{x(2x + 3)}{2x - 3}$ **23.** $\dfrac{1}{4(x - 2)}$ **25.** $\dfrac{x + 3}{x - 3}$ **27.** $\dfrac{1}{t^2 + 9}$

29. $\dfrac{x + 4}{x + 1}$ **31.** $\dfrac{x + 5}{(2x + 3)(x + 4)}$ **33.** $\dfrac{(2x + 1)(2x - 1)}{(x + 5)^2}$

35. $x^2(x + 1)$ **37.** $\dfrac{x}{yz}$ **39.** $\dfrac{3(x + 2)}{x + 3}$ **41.** $\dfrac{3x + 7}{(x - 3)(x + 5)}$

43. $\dfrac{1}{(x + 1)(x + 2)}$ **45.** $\dfrac{3x + 2}{(x + 1)^2}$ **47.** $\dfrac{u^2 + 3u + 1}{u + 1}$

49. $\dfrac{2x + 1}{x^2(x + 1)}$ **51.** $\dfrac{2x + 7}{(x + 3)(x + 4)}$ **53.** $\dfrac{x - 2}{(x + 3)(x - 3)}$

55. $\dfrac{5x - 6}{x(x - 1)}$ **57.** $\dfrac{-5}{(x + 1)(x + 2)(x - 3)}$ **59.** $\dfrac{(x + 1)^2}{x^2 + 2x - 1}$

61. $\dfrac{4x - 7}{(x - 2)(x - 1)(x + 2)}$ **63.** $-xy$ **65.** $\dfrac{y - x}{xy}$ **67.** $\dfrac{1}{1 - x}$

69. $-\dfrac{1}{(1 + x)(1 + x + h)}$ **71.** $-\dfrac{2x + h}{x^2(x + h)^2}$ **73.** $\dfrac{1}{\sqrt{1 - x^2}}$

75. $\dfrac{(x + 2)^2(x - 13)}{(x - 3)^3}$ **77.** $\dfrac{x + 2}{(x + 1)^{3/2}}$ **79.** $\dfrac{2x + 3}{(x + 1)^{4/3}}$

81. $2 + \sqrt{3}$ **83.** $\dfrac{2(\sqrt{7} - \sqrt{2})}{5}$ **85.** $\dfrac{y\sqrt{3} - y\sqrt{y}}{3 - y}$

87. $\dfrac{-4}{3(1 + \sqrt{5})}$ **89.** $\dfrac{r - 2}{5(\sqrt{r} - \sqrt{2})}$ **91.** $\dfrac{1}{\sqrt{x^2 + 1} + x}$

93. Verdadera **95.** Falsa **97.** Falsa **99.** Verdadera

101. **(a)** $\dfrac{R_1R_2}{R_1 + R_2}$ **(b)** $\frac{20}{3} \approx 6.7$ ohms

SECCIÓN 1.5 ■ PÁGINA 54

1. **(a)** Verdadero **(b)** Falso (porque la cantidad podría ser 0) **(c)** Falso **2.** **(a)** Factorizar en $(x + 1)(x - 5)$ y usar la Propiedad del Producto Cero. **(b)** Sumar 5 a cada lado, entonces completar el cuadrado sumando 4 a ambos lados. **(c)** Insertar coeficientes en la Fórmula Cuadrática **3.** **(a)** 0, 4 **(b)** Factorizar
4. **(a)** $\sqrt{2x} = -x$ **(b)** $2x = x^2$ **(c)** 0, 2 **(d)** 0
5. Cuadrático; $x + 1$; $W^2 - 5W + 6 = 0$
6. Cuadrático; x^3; $W^2 + 7W - 8 = 0$ **7.** **(a)** No **(b)** Sí
9. **(a)** Sí **(b)** No **11.** 12 **13.** 18 **15.** -3 **17.** 12
19. $-\frac{3}{4}$ **21.** 30 **23.** $-\frac{1}{3}$ **25.** $\frac{13}{3}$ **27.** -2 **29.** $R = \dfrac{PV}{nT}$

31. $w = \dfrac{P - 2l}{2}$ **33.** $x = \dfrac{2d - b}{a - 2c}$ **35.** $x = \dfrac{1 - a}{a^2 - a - 1}$

37. $r = \pm\sqrt{\dfrac{3V}{\pi h}}$ **39.** $b = \pm\sqrt{c^2 - a^2}$

41. $t = \dfrac{-v_0 \pm \sqrt{v_0^2 + 2gh}}{g}$ **43.** $-4, 3$ **45.** 3, 4 **47.** $-\frac{3}{2}, \frac{5}{2}$

49. $-2, \frac{1}{3}$ **51.** ± 2 **53.** $-\dfrac{2 \pm \sqrt{10}}{3}$ **55.** $-1 \pm \sqrt{6}$

57. $3 \pm 2\sqrt{5}$ **59.** $-2 \pm \frac{\sqrt{14}}{2}$ **61.** $0, \frac{1}{4}$ **63.** $-3, 5$ **65.** 2, 5

67. $-\frac{3}{2}, 1$ **69.** $-1 \pm \frac{2\sqrt{6}}{3}$ **71.** $\frac{3}{4}$ **73.** $-\frac{9}{2}, \frac{1}{2}$

75. No hay solución real **77.** $\dfrac{-8 \pm \sqrt{14}}{10}$ **79.** 2 **81.** 1

83. No hay solución real **85.** $-\frac{7}{5}, 2$ **87.** $-50, 100$ **89.** -4
91. 4 **93.** 3 **95.** $\pm 2\sqrt{2}, \pm\sqrt{5}$ **97.** No hay solución real
99. $\pm 3\sqrt{3}, \pm 2\sqrt{2}$ **101.** $-1, 0, 3$ **103.** 27, 729
105. $-2, -\frac{4}{3}$ **107.** 3.99, 4.01 **109.** 4.24 s
111. **(a)** Después de1 s y $1\frac{1}{2}$ s **(b)** Nunca **(c)** 25 pies **(d)** Después de $1\frac{1}{4}$ s **(e)** Después de $2\frac{1}{2}$ s **113.** **(a)** 0.00055, 12.018 m **(b)** 234.375 kg/m^3 **115.** **(a)** Después de 17 años, el 1 de enero, 2019 **(b)** Después de 18.612 años, el 12 de agosto de 2020 **117.** 50 **119.** 132.6 pies

SECCIÓN 1.6 ■ PÁGINA 67

2. principal; tasa de interés; tiempo en años **3.** **(a)** x^2 **(b)** lw
(c) πr^2 **4.** 1.6 **5.** $\dfrac{1}{x}$ **6.** $r = \dfrac{d}{t}$, $t = \dfrac{d}{r}$ **7.** $3n + 3$

9. $\dfrac{160 + s}{3}$ **11.** $0.025x$ **13.** $3w^2$ **15.** $\frac{3}{4}s$ **17.** $\dfrac{25}{3 + x}$

19. 400 mi **21.** \$9000 al $4\frac{1}{2}$% y \$3000 al 4% **23.** 7.5% **25.** \$7400
27. \$45,000 **29.** Plomero, 70 h; ayudante, 35 h **31.** 40 años de edad
33. 9 de 1 centavo, 9 de 5 centavos, 9 de diez centavos **35.** 45 pies
37. 120 pies por 120 pies **39.** 25 pies por 35 pies **41.** 60 pies por 40 pies **43.** 120 pies **45.** **(a)** 9 cm **(b)** 5 pulg. **47.** 4 pulg. **49.** 18 pies
51. 5 m **53.** 200 mL **55.** 18 g **57.** 0.6 L **59.** 35% **61.** 37 min 20 s
63. 3 h **65.** Irene 3 h, Henry $4\frac{1}{2}$ h **67.** 4 h

69. 500 mi/h **71.** 50 mi/h (o 240 mi/h) **73.** 6 km/h
75. 6.4 pies del fulcro **77.** 2 pies por 6 pies por 15 pies
79. 13 pulg. por 13 pulg. **81.** 2.88 pies **83.** 16 mi; no **85.** 7.52 pies
87. 18 pies **89.** 4.55 pies

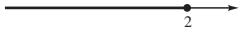
SECCIÓN 1.7 ■ PÁGINA 80

1. (a) $<$ **(b)** $\leq$ **(c)** $\leq$ **(d)** $>$ **2. (a)** Verdadero **(b)** Falso
3. (a) $[-3, 3]$ **(b)** $(-\infty, -3], [3, \infty)$ **4. (a)** < 3 **(b)** > 3
5. $\{\sqrt{2}, 2, 4\}$ **7.** $\{4\}$ **9.** $\{-2, -1, 2, 4\}$

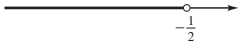
11. $(-\infty, \frac{7}{2}]$

13. $(4, \infty)$

15. $(-\infty, 2]$



17. $(-\infty, -\frac{1}{2})$



19. $[1, \infty)$

21. $(\frac{16}{3}, \infty)$

23. $(-\infty, -18)$

25. $(-\infty, -1]$

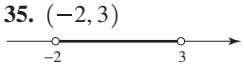
27. $[-3, -1)$

29. $(2, 6)$

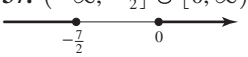
31. $[\frac{9}{2}, 5)$

33. $(\frac{15}{2}, \frac{21}{2}]$

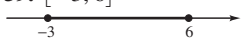
35. $(-2, 3)$



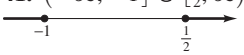
37. $(-\infty, -\frac{7}{2}] \cup [0, \infty)$



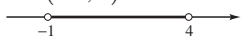
39. $[-3, 6]$



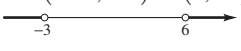
41. $(-\infty, -1] \cup [\frac{1}{2}, \infty)$



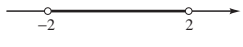
43. $(-1, 4)$



45. $(-\infty, -3) \cup (6, \infty)$



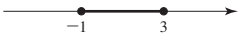
47. $(-2, 2)$



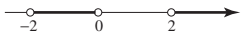
49. $(-\infty, -2] \cup [1, 3]$

51. $(-\infty, -2] \cup (-2, 4)$

53. $[-1, 3]$

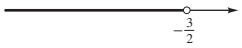


55. $(-2, 0) \cup (2, \infty)$



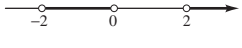
57. $(-\infty, -1) \cup [3, \infty)$

59. $(-\infty, -\frac{3}{2})$

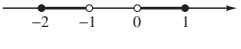


61. $(-\infty, 5) \cup [16, \infty)$

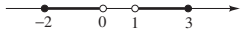
63. $(-2, 0) \cup (2, \infty)$



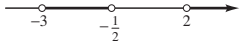
65. $[-2, -1) \cup (0, 1]$



67. $[-2, 0) \cup (1, 3]$



69. $(-3, -\frac{1}{2}) \cup (2, \infty)$

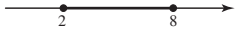


71. $(-\infty, -1) \cup (1, \infty)$

73. $[-4, 4]$

75. $(-\infty, -\frac{7}{2}) \cup (\frac{7}{2}, \infty)$

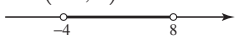
77. $[2, 8]$



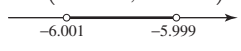
79. $[1.3, 1.7]$

81. $(-\infty, -1] \cup [\frac{7}{3}, \infty)$

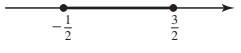
83. $(-4, 8)$



85. $(-6.001, -5.999)$



87. $[-\frac{1}{2}, \frac{3}{2}]$



89. $|x| < 3$ **91.** $|x - 7| \geq 5$ **93.** $|x| \leq 2$ **95.** $|x| > 3$
97. $|x - 1| \leq 3$ **99.** $-\frac{4}{3} \leq x \leq \frac{4}{3}$ **101.** $x < -2$ o $x > 7$

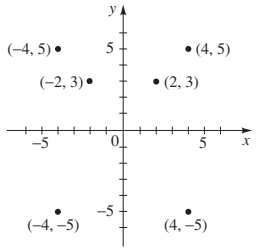
103. (a) $x \geq \dfrac{c}{a} + \dfrac{c}{b}$ **(b)** $\dfrac{a - c}{b} \leq x < \dfrac{2a - c}{b}$

105. $68 \leq F \leq 86$ **107.** Más de 200 mi
109. Entre 12,000 mi y 14,000 mi
111. (a) $-\frac{1}{3}P + \frac{560}{3}$ **(b)** De \$215 a \$290
113. Distancias entre 20,000 km y 100,000 km
115. De 0 s a 3 s **117.** Entre 0 y 60 mi/h
119. Entre 20 y 40 pies **121.** Entre 62.4 y 74.0 pulg.

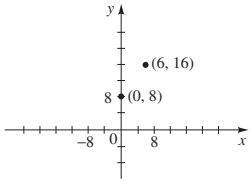
SECCIÓN 1.8 ■ PÁGINA 92

1. $(3, -5)$ **2.** $\sqrt{(c - a)^2 + (d - b)^2}$; 10
3. $\left(\dfrac{a + c}{2}, \dfrac{b + d}{2}\right)$; $(4, 6)$ **4.** 2; 3; No **5. (a)** y; x; -1
(b) x; y; $\frac{1}{2}$ **6.** $(1, 2)$; 3

7.

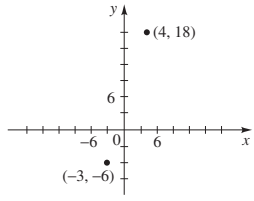


9. (a) $\sqrt{13}$ **(b)** $(\frac{3}{2}, 1)$ **11. (a)** 10 **(b)** $(1, 0)$
13. (a)

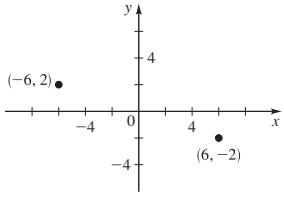


(b) 10 **(c)** $(3, 12)$

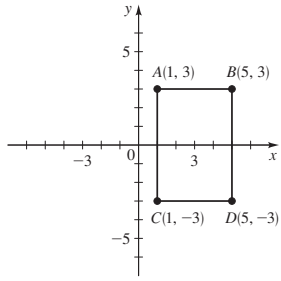
15. (a)



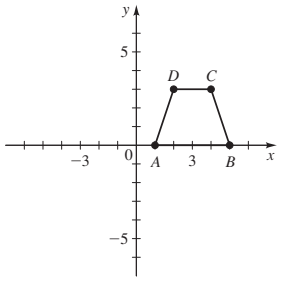
(b) 25 **(c)** $(\frac{1}{2}, 6)$
17. (a)



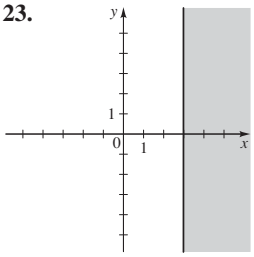
(b) $4\sqrt{10}$ **(c)** $(0, 0)$
19. 24



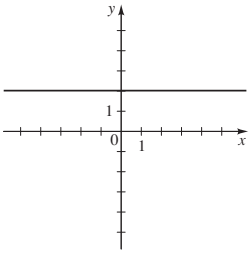
21. Trapecio, área $= 9$



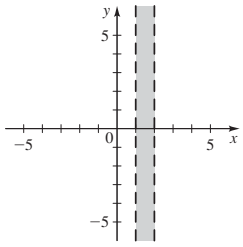
23.



25.



27.



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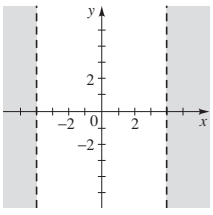
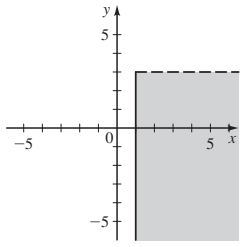
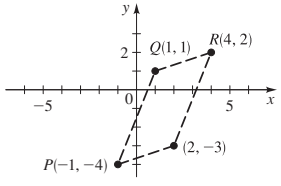


31.

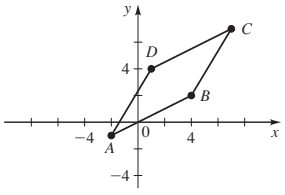


33. $A(6, 7)$ **35.** $Q(-1, 3)$ **39. (b)** 10 **43.** $(0, -4)$

45. $(2, -3)$



47. (a)



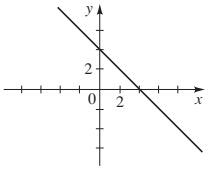
(b) $\left(\frac{5}{2}, 3\right), \left(\frac{5}{2}, 3\right)$

49. No, sí, sí **51.** Sí, no, sí

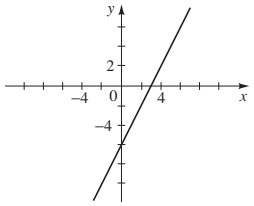
53. Puntos de intersección x 0, 4; punto de intersección y 0

55. Puntos de intersección $x -2, 2$; puntos de intersección $y -4, 4$

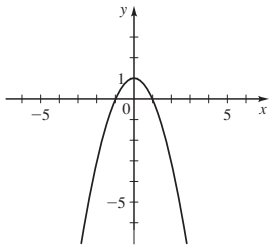
57. Punto de intersección x 4, punto de intersección y 4, no hay simetría



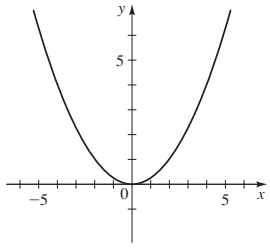
59. Punto de intersección x 3, punto de intersección $y -6$, no hay simetría



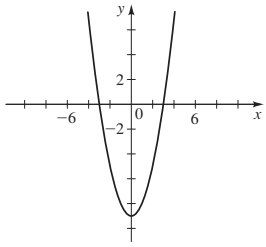
61. Punto de intersección $x \pm 1$, punto de intersección y 1, simetría respecto al eje y



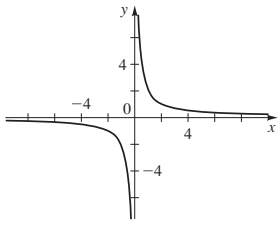
63. Punto de intersección x 0, punto de intersección y 0, simetría respecto al eje y



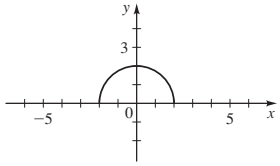
65. Punto de intersección $x \pm 3$, punto de intersección $y -9$, simetría respecto al eje y



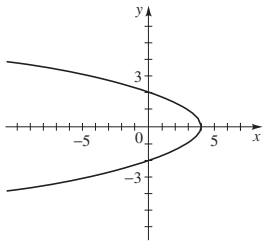
67. No hay intersección, simetría respecto al origen



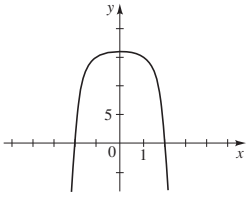
69. Puntos de intersección $x \pm 2$, punto de intersección y 2, simetría respecto al eje y



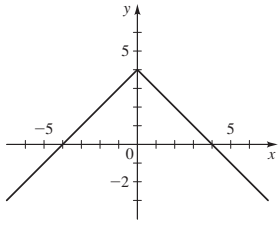
71. Punto de intersección x 4, puntos de intersección $y -2$, 2, simetría respecto al eje x



73. Puntos de intersección $x \pm 2$, punto de intersección y 16, simetría respecto al eje y



75. Puntos de intersección $x \pm 4$, punto de intersección y 4, simetría respecto al eje y

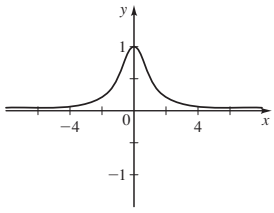


77. Simetría respecto al eje y

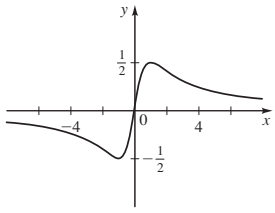
79. Simetría respecto al origen

81. Simetría respecto al origen

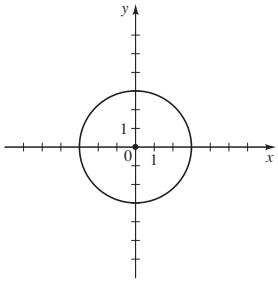
83.



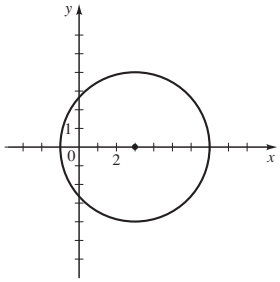
85.



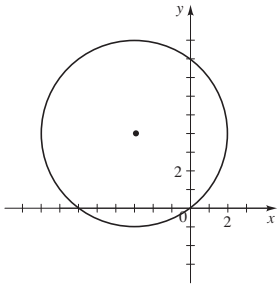
87. $(0, 0)$, 3



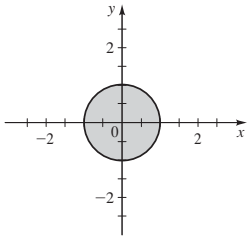
89. $(3, 0)$, 4



91. $(-3, 4)$, 5



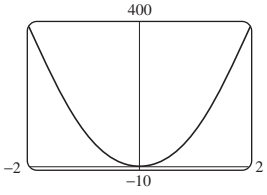
93. $(x-2)^2 + (y+1)^2 = 9$ **95.** $x^2 + y^2 = 65$
97. $(x-2)^2 + (y-5)^2 = 25$ **99.** $(x-7)^2 + (y+3)^2 = 9$
101. $(x+2)^2 + (y-2)^2 = 4$ **103.** $(2, -5), 4$ **105.** $\left(\frac{1}{4}, -\frac{1}{4}\right), \frac{1}{2}$
107. $\left(\frac{3}{4}, 0\right), \frac{3}{4}$
109.



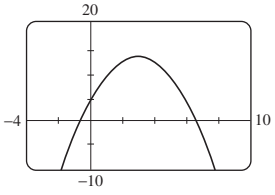
111. 12π **113.** **(a)** 5 **(b)** 31; 25 **(c)** Los puntos P y Q deben estar en la misma calle o la misma avenida.
115. **(a)** 2 Mm, 8 Mm **(b)** −1.33, 7.33; 2.40 Mm, 7.60 Mm

SECCIÓN 1.9 ■ PÁGINA 104

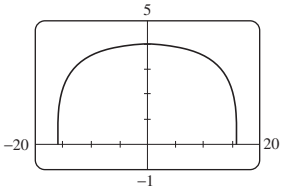
1. x **2.** arriba **3.** **(a)** $x = -1, 0, 1, 3$ **(b)** $[-1, 0] \cup [1, 3]$
4. **(a)** $x = 1, 4$ **(b)** $(1, 4)$ **5.** (c) **7.** (c) **9.** (c)
11.



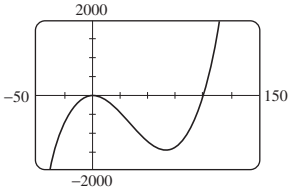
13.



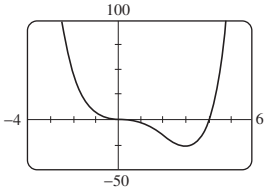
15.



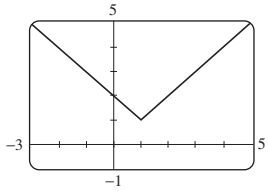
17.



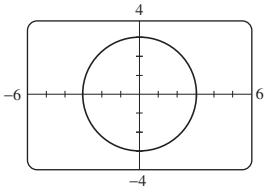
19.



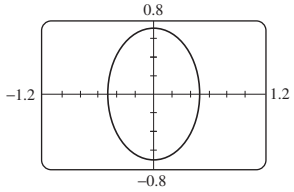
21.



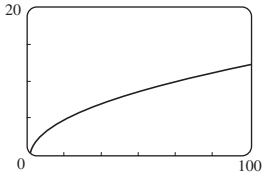
23. No **25.** Sí, 2
27.



29.



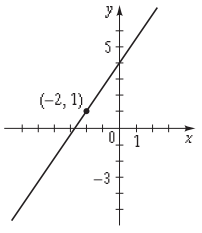
31. -4 **33.** $\frac{5}{14}$ **35.** $\pm 4\sqrt{2} \approx \pm 5.7$ **37.** No hay solución
39. 2.5, −2.5 **41.** $5 + 2\sqrt[4]{5} \approx 7.99$, $5 - 2\sqrt[4]{5} \approx 2.01$
43. 3.00, 4.00 **45.** 1.00, 2.00, 3.00 **47.** 1.62
49. −1.00, 0.00, 1.00 **51.** 4 **53.** No hay solución
55. 2.55 **57.** −2.05, 0, 1.05 **59.** $[-2.00, 5.00]$
61. $(-\infty, 1.00] \cup [2.00, 3.00]$ **63.** $(-1.00, 0) \cup (1.00, \infty)$
65. $(-\infty, 0)$ **67.** $(-1, 4)$ **69.** $[-1, 3]$ **71.** 0, 0.01
73. **(a)**



(b) 67 mi

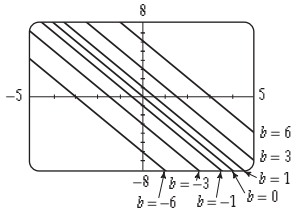
SECCIÓN 1.10 ■ PÁGINA 115

1. y; x; 2 **2.** **(a)** 3 **(b)** 3 **(c)** $-\frac{1}{3}$ **3.** $y - 2 = 3(x - 1)$
4. **(a)** 0; $y = 3$ **(b)** No está definida; $x = 2$ **5.** $\frac{1}{2}$ **7.** $\frac{1}{6}$
9. $-\frac{1}{2}$ **11.** $-\frac{9}{2}$ **13.** $-2, \frac{1}{2}, 3, -\frac{1}{4}$ **15.** $x + y - 4 = 0$
17. $3x - 2y - 6 = 0$ **19.** $5x - y - 7 = 0$
21. $2x - 3y + 19 = 0$ **23.** $5x + y - 11 = 0$
25. $3x - y - 2 = 0$ **27.** $3x - y - 3 = 0$ **29.** $y = 5$
31. $x + 2y + 11 = 0$ **33.** $x = -1$ **35.** $5x - 2y + 1 = 0$
37. $x - y + 6 = 0$
39. **(a)**

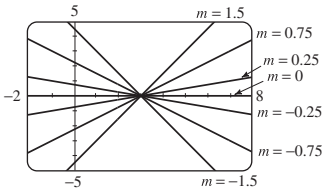


(b) $3x - 2y + 8 = 0$

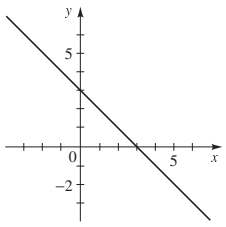
41. Todas tienen la misma pendiente.



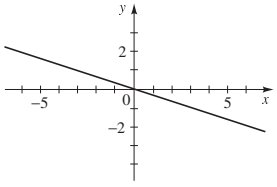
43. Todas tienen el mismo punto de intersección x.



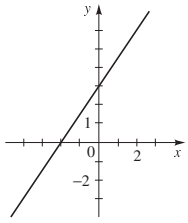
45. $-1, 3$



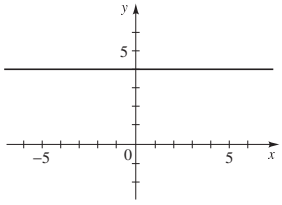
47. $-\frac{1}{3}, 0$



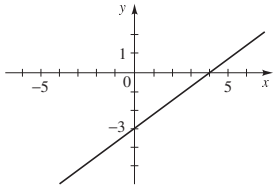
49. $\frac{3}{2}, 3$



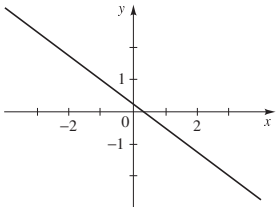
51. $0, 4$



53. $\frac{3}{4}, -3$

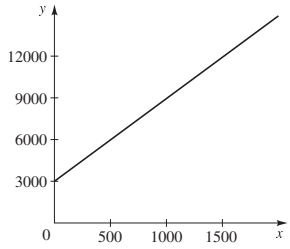


55. $-\frac{3}{4}, \frac{1}{4}$



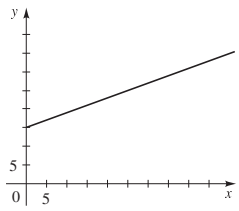
61. $x - y - 3 = 0$ **63.** **(b)** $4x - 3y - 24 = 0$ **65.** 16,667 pies
67. **(a)** 8.34; la pendiente representa el aumento en dosis para un año de aumento en edad. **(b)** 8.34 mg

69. **(a)**



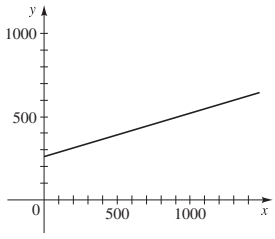
(b) La pendiente representa el costo de producción por tostador; el punto de intersección y representa el costo fijo mensual.

71. **(a)** $t = \frac{5}{24}n + 45$ **(b)** 76°F
73. **(a)** $P = 0.434d + 15$, donde P es la presión en lb/pulg.^{2} y d es la profundidad en pies
(b)



(c) La pendiente es el aumento en la presión del agua, y el punto de intersección y es la presión del aire en la superficie. **(d)** 196 pies

75. **(a)** $C = \frac{1}{4}d + 260$
(b) \$635
(c) La pendiente representa costo por milla.
(d) El punto de intersección y representa el costo mensual fijo.



SECCIÓN 1.11 ■ PÁGINA 121

1. Directamente proporcional; proporcionalidad **2.** Inversamente proporcional; proporcionalidad **3.** Directamente proporcional; inversamente proporcional **4.** $\frac{1}{2}xy$ **5.** $T = kx$ **7.** $v = k/z$

9. $y = ks/t$ **11.** $z = k\sqrt{y}$ **13.** $V = klwh$ **15.** $R = k\dfrac{i}{Pt}$

17. $y = 7x$ **19.** $R = 12/s$ **21.** $M = 15x/y$ **23.** $W = 360/r^2$
25. $C = 16lwh$ **27.** $s = 500/\sqrt{t}$ **29.** **(a)** $F = kx$ **(b)** 8
(c) 32 N **31.** **(a)** $C = kpm$ **(b)** 0.125 **(c)** \$57,500
33. **(a)** $P = ks^3$ **(b)** 0.012 **(c)** 324 **35.** 0.7 dB **37.** 4
39. 5.3 mi/h **41.** **(a)** $R = kL/d^2$ **(b)** $0.002916\overline{6}$ **(c)** $R \approx 137\ \Omega$
43. **(a)** 160,000 **(b)** 1,930,670,340 **45.** 36 lb

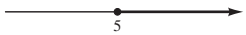
47. **(a)** $f = \dfrac{k}{L}$ **(b)** La reduce a la mitad

REPASO DEL CAPÍTULO 1 ■ PÁGINA 125

1. Propiedad Conmutativa para la adición
3. Propiedad Distributiva

5. $-2 \le x < 6$

7. $[5, \infty)$



9. 6 **11.** $\frac{1}{72}$ **13.** $\frac{1}{6}$ **15.** 11 **17.** 4 **19.** $16x^3$ **21.** $12xy^8$

23. x^2y^2 **25.** $3x^{3/2}y^2$ **27.** $\dfrac{4r^{5/2}}{s^7}$ **29.** 7.825×10^{10}

31. 1.65×10^{-32} **33.** $3xy^2(4xy^2 - y^3 + 3x^2)$
35. $(x - 2)(x + 5)$ **37.** $(4t + 3)(t - 4)$ **39.** $(5 - 4t)(5 + 4t)$
41. $(x - 1)(x^2 + x + 1)(x + 1)(x^2 - x + 1)$
43. $x^{-1/2}(x - 1)^2$ **45.** $(x - 2)(4x^2 + 3)$
47. $\sqrt{x^2 + 2}(x^2 + x + 2)^2$ **49.** $6x^2 - 21x + 3$ **51.** $-7 + x$

53. $2x^3 - 6x^2 + 4x$ **55.** $\dfrac{3(x + 3)}{x + 4}$ **57.** $\dfrac{x + 1}{x - 4}$ **59.** $\dfrac{1}{x + 1}$

61. $-\dfrac{1}{2x}$ **63.** $3\sqrt{2} - 2\sqrt{3}$ **65.** 5 **67.** No hay solución

69. 2, 7 **71.** $-1, \frac{1}{2}$ **73.** $0, \pm\frac{5}{2}$ **75.** $\dfrac{-2 \pm \sqrt{7}}{3}$ **77.** -5

79. 3, 11 **81.** 20 lb de pasitas, 30 lb de nueces

83. $\frac{1}{4}(\sqrt{329} - 3) \approx 3.78$ mi/h **85.** 1 h 50 min

87. $(-3, \infty)$

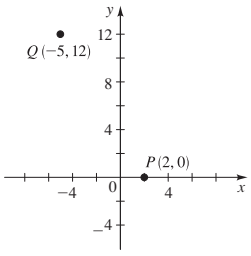
89. $(-\infty, -6) \cup (2, \infty)$

91. $(-\infty, -2) \cup (2, 4]$

93. $[2, 8]$

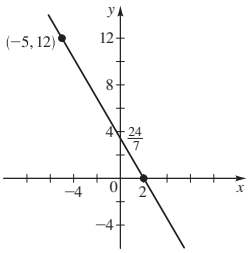
95. $-1, 7$ **97.** $[1, 3]$

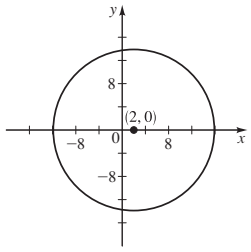
99. (a)



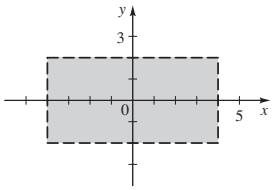
(b) $\sqrt{193}$ **(c)** $\left(-\frac{3}{2}, 6\right)$

(d) $y = -\frac{12}{7}x + \frac{24}{7}$ **(e)** $(x - 2)^2 + y^2 = 193$





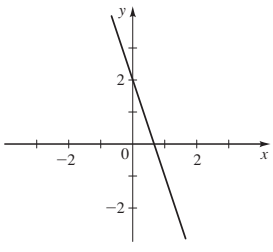
101.



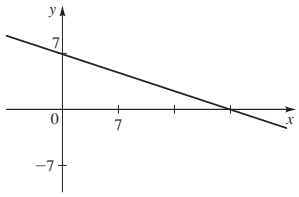
103. B **105.** $(x + 5)^2 + (y + 1)^2 = 26$

107. Circunferencia, centro $(-1, 3)$, radio 1 **109.** No hay gráfica

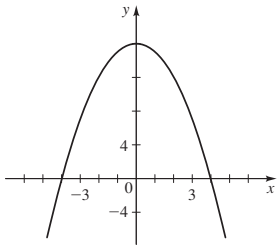
111. No hay simetría



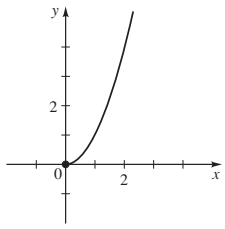
113. No hay simetría



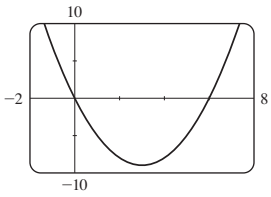
115. Simetría respecto al eje y



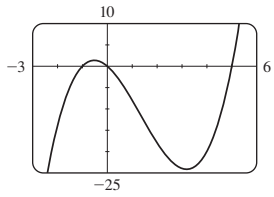
117. No hay simetría



119.



121.



123. $2x - 3y - 16 = 0$ **125.** $3x + y - 12 = 0$

127. $x + 5y = 0$ **129.** $x^2 + y^2 = 169, 5x - 12y + 169 = 0$

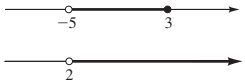
131. (a) La pendiente representa la cantidad que el resorte se estira para un aumento de una libra en peso. El punto de intersección S representa la longitud no estirada del resorte. **(b)** 4 pulg.

133. $M = 8z$ **135. (a)** $I = k/d^2$ **(b)** 64,000 **(c)** 160 candelas

137. 11.0 mi/h

CAPÍTULO 1 EXAMEN ■ PÁGINA 128

1. (a)



(b) $(-\infty, 3], [-1, 4)$ **(c)** 16

2. (a) 81 **(b)** -81 **(c)** $\frac{1}{81}$ **(d)** 25 **(e)** $\frac{9}{4}$ **(f)** $\frac{1}{8}$

3. (a) 1.86×10^{11} **(b)** 3.965×10^{-7}

4. (a) $6\sqrt{2}$ **(b)** $48a^5b^7$ **(c)** $\dfrac{x}{9y^7}$ **(d)** $\dfrac{x+2}{x-2}$ **(e)** $\dfrac{1}{x-2}$

(f) $-(x + y)$ **5.** $5\sqrt{2} + 2\sqrt{10}$

6. (a) $11x - 2$ **(b)** $4x^2 + 7x - 15$ **(c)** $a - b$

(d) $4x^2 + 12x + 9$ **(e)** $x^3 + 6x^2 + 12x + 8$

7. (a) $(2x - 5)(2x + 5)$ **(b)** $(2x - 3)(x + 4)$

(c) $(x - 3)(x - 2)(x + 2)$

(d) $x(x + 3)(x^2 - 3x + 9)$

(e) $3x^{-1/2}(x - 1)(x - 2)$ **(f)** $xy(x - 2)(x + 2)$

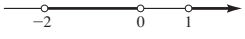
8. (a) 6 **(b)** 1 **(c)** $-3, 4$ **(d)** $-1 \pm \dfrac{\sqrt{2}}{2}$

(e) No hay solución real **(f)** $\pm 1, \pm\sqrt{2}$ **(g)** $\frac{2}{3}, \frac{22}{3}$ **9.** 120 mi

10. 50 pies por 120 pies

11. (a) $[-4, 3)$

(b) $(-2, 0) \cup (1, \infty)$



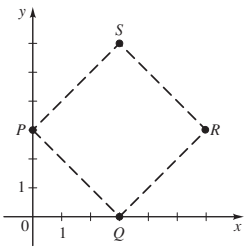
(c) $(1, 7)$

(d) $(-1, 4]$

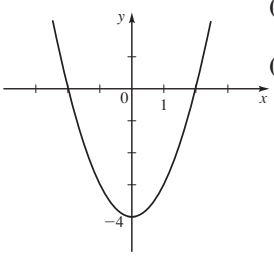
12. Entre 41 °F y 50 °F **13.** $0 \le x \le 6$

14. (a) $-2.94, -0.11, 3.05$ **(b)** $[-1, 2]$

15. **(a)** $S(3, 6)$ **(b)** 18

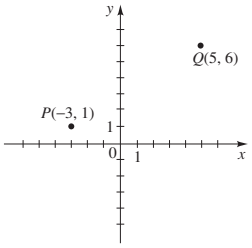


16. **(a)**



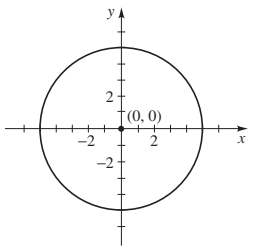
(b) Puntos de intersección -2, 2 punto de intersección y -4
(c) Simetría respecto al eje y

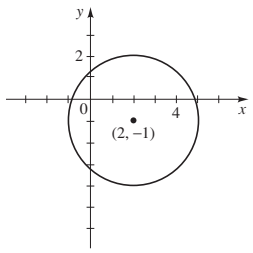
17. **(a)**



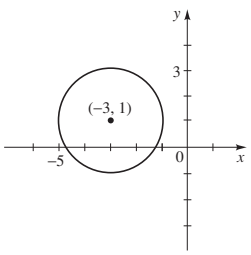
(b) $\sqrt{89}$ **(c)** $\left(1, \frac{7}{2}\right)$ **(d)** $\frac{5}{8}$ **(e)** $y = -\frac{8}{5}x + \frac{51}{10}$
(f) $(x - 1)^2 + \left(y - \frac{7}{2}\right)^2 = \frac{89}{4}$

18. **(a)** $(0, 0)$, 5 **(b)** $(2, -1)$, 3

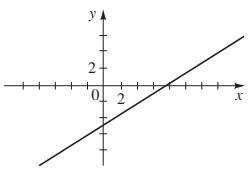




(c) $(-3, 1)$, 2



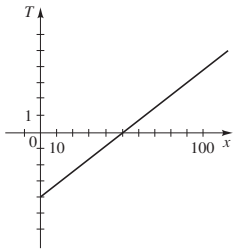
19. $y = \frac{2}{3}x - 5$



pendiente $\frac{2}{3}$; punto de intersección y -5

20. **(a)** $3x + y - 3 = 0$ **(b)** $2x + 3y - 12 = 0$

21. **(a)** 4°C **(b)**

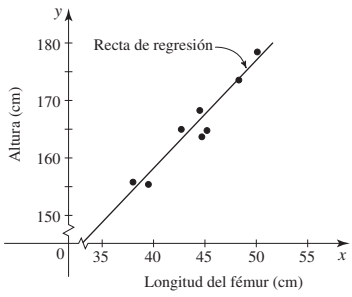


(c) La pendiente es el cambio en temperatura, el punto de intersección x es la profundidad a la cual la temperatura es 0 °C, y el punto de intersección T es la temperatura al nivel del suelo.

22. **(a)** $M = kwh^2/L$ **(b)** 400 **(c)** 12,000 lb

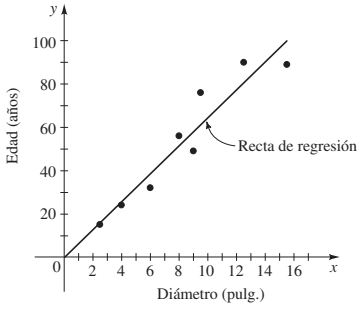
ENFOQUE SOBRE MODELADO ■ PÁGINA 135

1. **(a)**



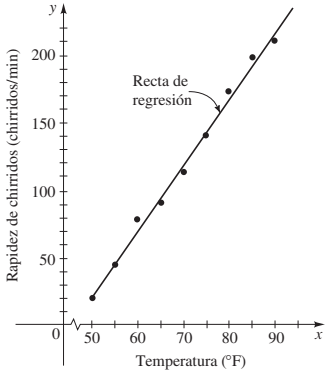
(b) $y = 1.8807x + 82.65$
(c) 191.7 cm

3. **(a)**



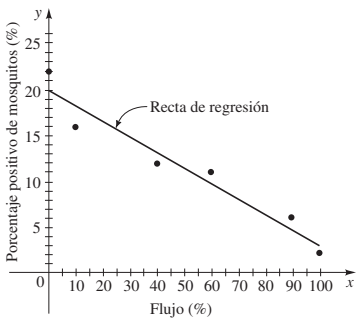
(b) $y = 6.451x - 0.1523$
(c) 116 años

5. **(a)**



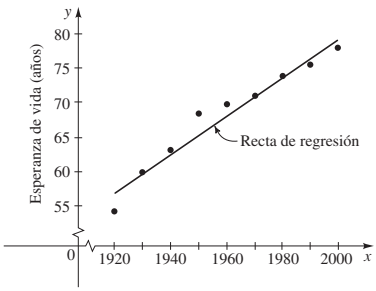
(b) $y = 4.857x - 220.97$
(c) 265 chirridos/min

7. (a)



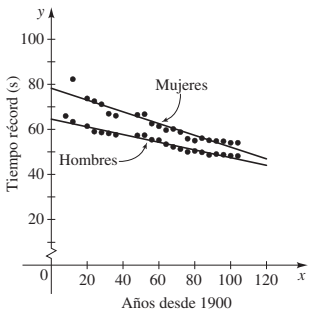
(b) $y = -0.168x + 19.89$ **(c)** 8.13%

9. (a)



(b) $y = 0.2708x - 462.9$ **(c)** 80.3 años

11. (a) Hombres: $y = -0.1703x + 64.61$, mujeres $y = -0.2603x + 78.27$; x representa años desde1900 **(b)** 2052



CAPÍTULO 2

SECCIÓN 2.1 ■ PÁGINA 149

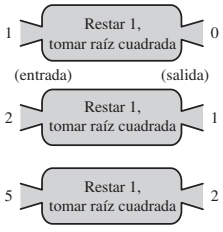
1. valor **2.** dominio, rango **3. (a)** f y g
(b) $f(5) = 10, g(5) = 0$ **4. (a)** elevar al cuadrado, sumar 3

(b)

x	0	2	4	6
$f(x)$	19	7	3	7

5. $f(x) = 2(x + 3)$ **7.** $f(x) = (x - 5)^2$ **9.** Elevar al cuadrado, luego sumar 2 **11.** Restar 4, luego dividir entre 3

13.



15.

x	$f(x)$
-1	8
0	2
1	0
2	2
3	8

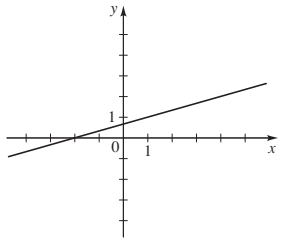
17. $3, 3, -6, -\frac{23}{4}, 94$ **19.** $3, -3, 2, 2a + 1, -2a + 1, 2a + 2b + 1$
21. $-\frac{1}{3}, -3, \frac{1}{3}, \frac{1 - a}{1 + a}, \frac{2 - a}{a}$, no está definida
23. $-4, 10, -2, 3\sqrt{2}, 2x^2 + 7x + 1, 2x^2 - 3x - 4$
25. $6, 2, 1, 2, 2|x|, 2(x^2 + 1)$ **27.** $4, 1, 1, 2, 3$
29. $8, -\frac{3}{4}, -1, 0, -1$ **31.** $x^2 + 4x + 5, x^2 + 6$
33. $x^2 + 4, x^2 + 8x + 16$ **35.** $3a + 2, 3(a + h) + 2, 3$
37. $5, 5, 0$ **39.** $\frac{a}{a + 1}, \frac{a + h}{a + h + 1}, \frac{1}{(a + h + 1)(a + 1)}$
41. $3 - 5a + 4a^2, 3 - 5a - 5h + 4a^2 + 8ah + 4h^2, -5 + 8a + 4h$
43. $(-\infty, \infty)$ **45.** $[-1, 5]$ **47.** $\{x \mid x \neq 3\}$ **49.** $\{x \mid x \neq \pm 1\}$
51. $[5, \infty)$ **53.** $(-\infty, \infty)$ **55.** $[\frac{5}{2}, \infty)$ **57.** $[-2, 3) \cup (3, \infty)$
59. $(-\infty, 0] \cup [6, \infty)$ **61.** $(4, \infty)$ **63.** $(\frac{1}{2}, \infty)$

65. (a) $f(x) = \frac{x}{3} + \frac{2}{3}$

(b)

x	$f(x)$
2	$\frac{4}{3}$
4	2
6	$\frac{8}{3}$
8	$\frac{10}{3}$

(c)

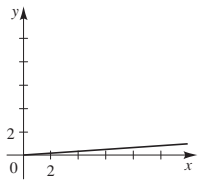


67. (a) $T(x) = 0.08x$

(b)

x	$T(x)$
2	0.16
4	0.32
6	0.48
8	0.64

(c)



69. (a) $C(10) = 1532.1, C(100) = 2100$ **(b)** El costo de producir 10 yd y 100 yd 71. **(c)** $C(0) = 1500$ **71. (a)** 50, 0 **(b)** $V(0)$ es el volumen del tanque lleno, y $V(20)$ es el volumen del tanque vacío, 20 minutos más tarde.

(c)

x	$V(x)$
0	50
5	28.125
10	12.5
15	3.125
20	0

$V(20)$

73. (a) $v(0.1) = 4440, v(0.4) = 1665$
(b) El flujo es más rápido cerca del eje central.

(c)

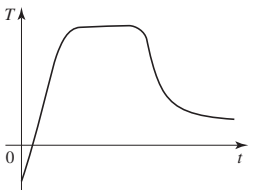
r	$v(r)$
0	4625
0.1	4440
0.2	3885
0.3	2960
0.4	1665
0.5	0

75. **(a)** 8.66 m, 6.61 m, 4.36 m
(b) Parecerá acortarse.
77. **(a)** \$90, \$105, \$100, \$105
(b) Costo total de un pedido, incluyendo envío

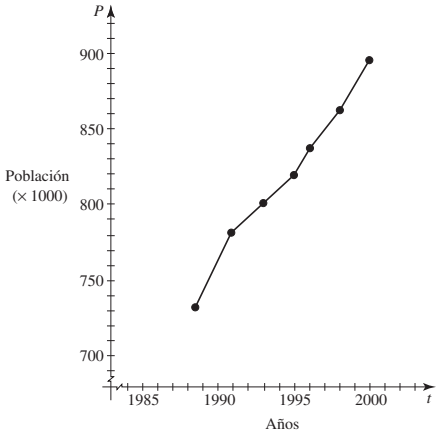
79. **(a)** $F(x) = \begin{cases} 15(40 - x) & \text{si } 0 < x < 40 \\ 0 & \text{si } 40 \le x \le 65 \\ 15(x - 65) & \text{si } x > 65 \end{cases}$

(b) \$150, \$0, \$150
(c) Infracciones por violar límites de velocidad

81.



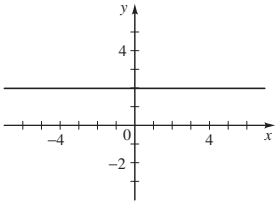
83.



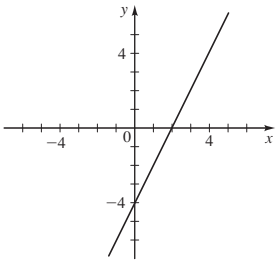
SECCIÓN 2.2 ■ PÁGINA 159

1. $f(x)$, $x^3 + 2$, 10, 10 **2.** 3 **3.** 3
4. **(a)** IV **(b)** II **(c)** I **(d)** III

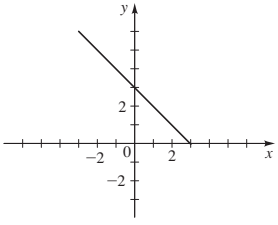
5.



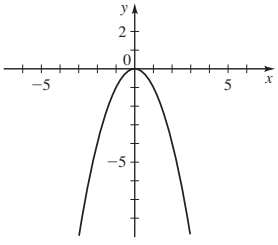
7.



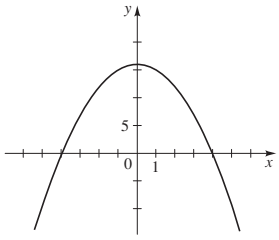
9.



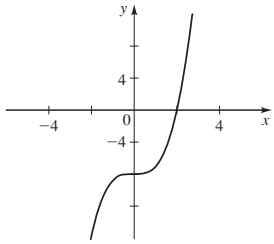
11.



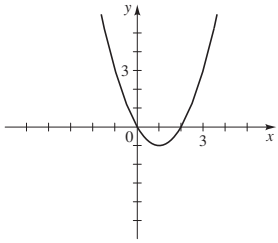
13.



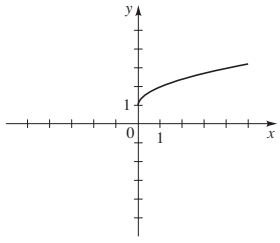
15.



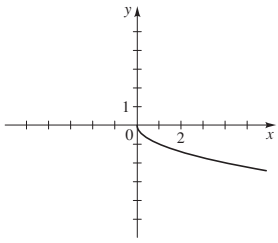
17.



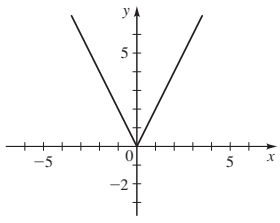
19.



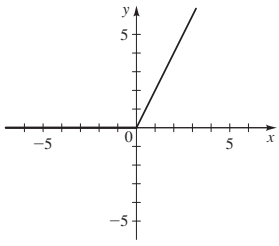
21.



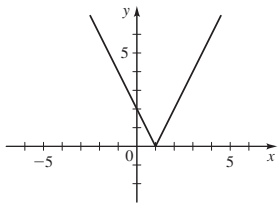
23.



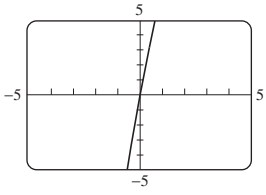
25.



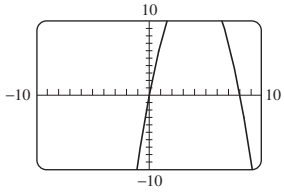
27.



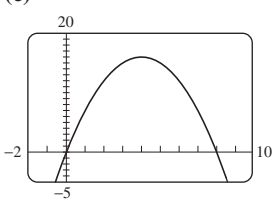
29. **(a)**



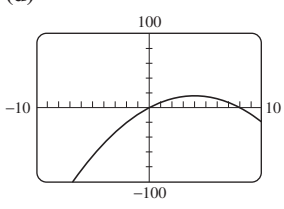
(b)



(c)

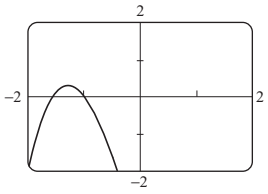


(d)

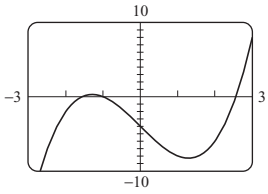


La gráfica (c) es la más apropiada.

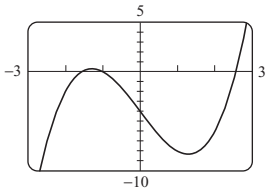
31. (a)



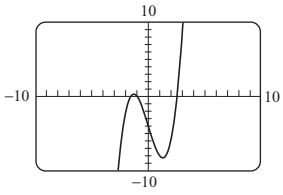
(b)



(c)

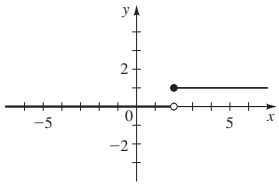


(d)

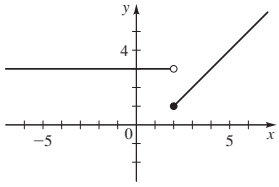


La gráfica (c) es la más apropiada.

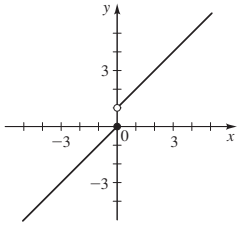
33.



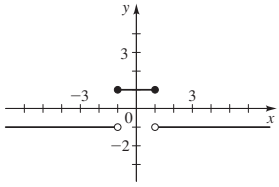
35.



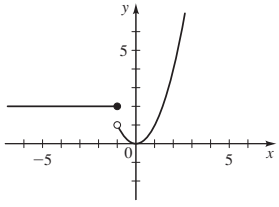
37.



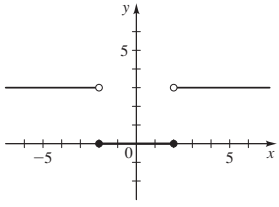
39.



41.



43.



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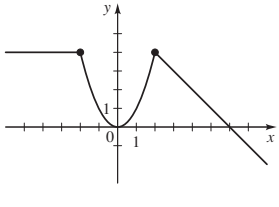
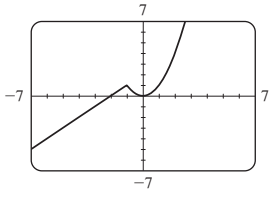


47.



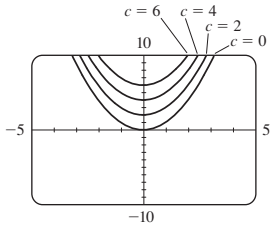
49. $f(x) = \begin{cases} -2 & \text{si } x < -2 \\ x & \text{si } -2 \le x \le 2 \\ 2 & \text{si } x > 2 \end{cases}$

51. (a) Sí **(b)** No **(c)** Sí **(d)** No

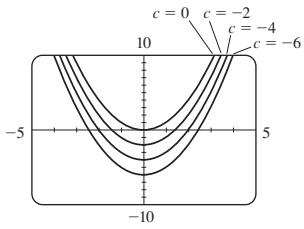
53. Función, dominio $[-3, 2]$, rango $[-2, 2]$ **55.** No es una función

57. Sí **59.** No **61.** No **63.** Sí **65.** Sí **67.** Sí

69. (a)

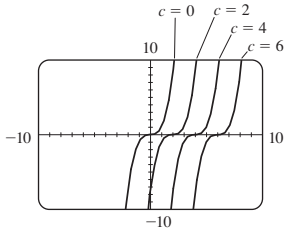


(b)

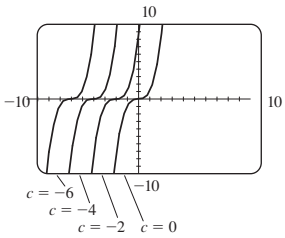


(c) Si $c > 0$, entonces la gráfica de $f(x) = x^2 + c$ es la misma que la gráfica de $y = x^2$ desplazada hacia arriba c unidades. Si $c < 0$, entonces la gráfica de $f(x) = x^2 + c$ es la misma que la gráfica de $y = x^2$ desplazada hacia abajo c unidades.

71. (a)

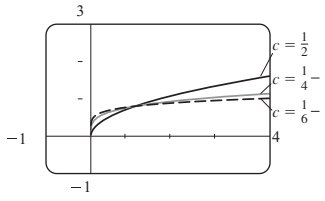


(b)

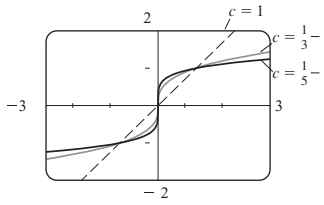


(c) Si $c > 0$, entonces la gráfica de $f(x) = (x - c)^3$ es la misma que la gráfica de $y = x^3$ desplazada a la derecha c unidades. Si $c < 0$, entonces la gráfica de $f(x) = (x - c)^3$ es la misma que la gráfica de $y = x^3$ desplazada a la izquierda c unidades.

73. (a)



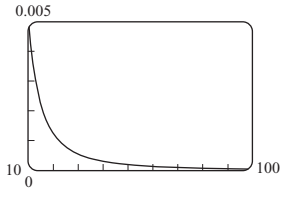
(b)



(c) Las gráficas de raíces pares son semejantes a $\sqrt{x}$; las gráficas de raíces impares son semejantes a $\sqrt[3]{x}$. Cuando c aumenta, la gráfica de $y = \sqrt[c]{x}$ se hace más pronunciada cerca de 0 y más plana cuando $x > 1$. **75.** $f(x) = -\frac{7}{6}x - \frac{4}{3}$, $-2 \le x \le 4$

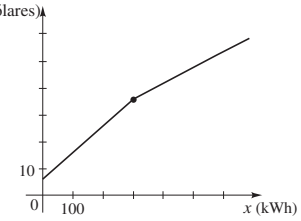
77. $f(x) = \sqrt{9 - x^2}$, $-3 \le x \le 3$

79.

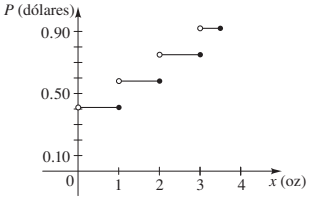


81. (a) $E(x) = \begin{cases} 6 + 0.10x & 0 \le x \le 300 \\ 36 + 0.06(x - 300), & x > 300 \end{cases}$

(b)



83. $P(x) = \begin{cases} 0.44 & \text{si } 0 < x \le 1 \\ 0.61 & \text{si } 1 < x \le 2 \\ 0.78 & \text{si } 2 < x \le 3 \\ 0.95 & \text{si } 3 < x \le 3.5 \end{cases}$



SECCIÓN 2.3 ■ PÁGINA 168

1. a, 4 **2.** x, y, $[1, 6]$, $[1, 7]$

3. (a) aumentan, $[1, 2]$, $[4, 5]$ **(b)** disminuyen, $[2, 4]$, $[5, 6]$

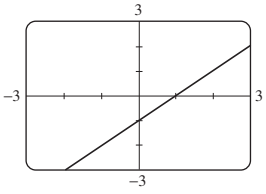
4. (a) máximo, 7, 2 **(b)** mínimo, 2, 4

5. (a) 1, −1, 3, 4 **(b)** Dominio $[-3, 4]$, rango $[-1, 4]$

(c) −3, 2, 4 **(d)** $-3 \le x \le 2$ y $x = 4$

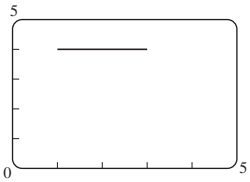
7. (a) 3, 2, −2, 1, 0 **(b)** Dominio $[-4, 4]$, rango $[-2, 3]$

9. (a)



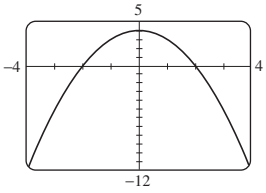
(b) Dominio $(-\infty, \infty)$, rango $(-\infty, \infty)$

11. (a)



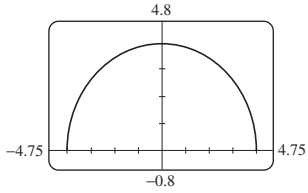
(b) Dominio $[1, 3]$, rango $\{4\}$

13. (a)



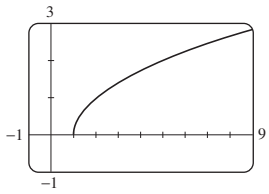
(b) Dominio $(-\infty, \infty)$, rango $(-\infty, 4]$

15. (a)



(b) Dominio $[-4, 4]$, rango $[0, 4]$

17. (a)

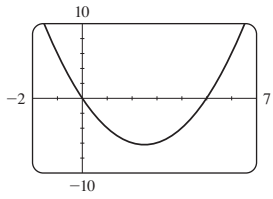


(b) Dominio $[1, \infty)$, rango $[0, \infty)$

19. (a) $[-1, 1]$, $[2, 4]$ **(b)** $[1, 2]$

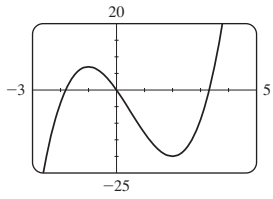
21. (a) $[-2, -1]$, $[1, 2]$ **(b)** $[-3, -2]$, $[-1, 1]$, $[2, 3]$

23. (a)



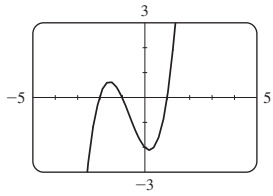
(b) Creciente sobre $[2.5, \infty)$; decreciente sobre $(-\infty, 2.5]$

25. (a)



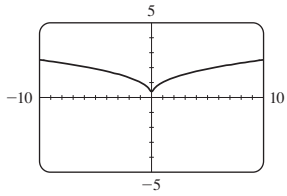
(b) Creciente sobre $(-\infty, -1]$, $[2, \infty)$; decreciente sobre $[-1, 2]$

27. (a)



(b) Creciente sobre $(-\infty, -1.55]$, $[0.22, \infty)$ decreciente sobre $[-1.55, 0.22]$

29. (a)



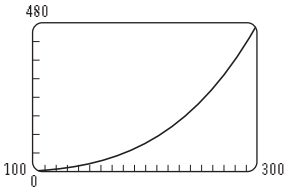
(b) Creciente sobre $[0, \infty)$; decreciente sobre $(-\infty, 0]$

31. (a) Máximo local 2 cuando $x = 0$; mínimo local −1 cuando $x = -2$, mínimo local 0 cuando $x = 2$ **(b)** Creciente sobre $[-2, 0] \cup [2, \infty)$; decreciente sobre $(-\infty, -2] \cup [0, 2]$

33. (a) Máximo local 0 cuando $x = 0$; mínimo local 1 cuando $x = 3$, mínimo local −2 cuando $x = -2$, mínimo local −1 cuando $x = 1$ **(b)** Creciente sobre $[-2, 0] \cup [1, 3]$; decreciente sobre $(-\infty, -2] \cup [0, 1] \cup [3, \infty)$ **35. (a)** Máximo local ≈ 0.38 cuando $x \approx -0.58$; mínimo local ≈ -0.38 cuando $x \approx 0.58$ **(b)** Creciente sobre $(-\infty, -0.58] \cup [0.58, \infty)$; decreciente sobre $[-0.58, 0.58]$ **37. (a)** Máximo local ≈ 0 cuando $x = 0$; mínimo local ≈ -13.61 cuando $x \approx -1.71$, mínimo local ≈ -73.32 cuando $x \approx 3.21$ **(b)** Creciente sobre $[-1.71, 0] \cup [3.21, \infty)$; decreciente sobre $(-\infty, -1.71] \cup [0, 3.21]$ **39. (a)** Máximo local ≈ 5.66 cuando $x \approx 4.00$ **(b)** Creciente sobre $(-\infty, 4.00]$; decreciente sobre $[4.00, 6.00]$ **41. (a)** Máximo local ≈ 0.38 cuando $x \approx -1.73$; mínimo local ≈ -0.38 cuando $x \approx 1.73$ **(b)** Creciente sobre $(-\infty, -1.73] \cup [1.73, \infty]$; decreciente sobre $[-1.73, 0) \cup (0, 1.73]$ **43. (a)** 500 MW, 725 MW **(b)** Entre las 3:00 a.m. y 4:00 a.m. **(c)** Justo antes del mediodía

45. (a) Creciente sobre $[0, 30] \cup [32, 68]$; decreciente sobre $[30, 32]$ **(b)** Se sometió a una dieta intensiva y bajó de peso, sólo para aumentar otra vez de peso. **47. (a)** Creciente sobre $[0, 150] \cup [300, \infty)$, decreciente sobre $[150, 300]$ **(b)** Máximo local cuando $x = 150$, mínimo local cuando $x = 300$

49. El corredor A ganó la carrera. Todos los corredores terminaron. El corredor B cayó pero se levantó otra vez para llegar en segundo lugar. **51. (a)**



(b) Aumenta **53.** 20 mi/h **55.** $r \approx 0.67$ cm

SECCIÓN 2.4 ■ PÁGINA 177

1. $\dfrac{\text{100 millas}}{\text{2 horas}} = 50$ mi/h **2.** $\dfrac{f(b) - f(a)}{b - a}$ **3.** $\dfrac{25 - 1}{5 - 1} = 6$

4. (a) secante **(b)** 3 **5.** $\frac{2}{3}$ **7.** $-\frac{4}{5}$ **9.** 3 **11.** 5 **13.** 60

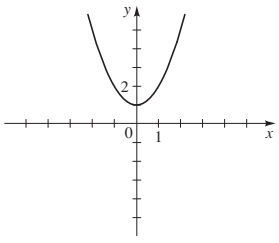
15. $12 + 3h$ **17.** $-\dfrac{1}{a}$ **19.** $\dfrac{-2}{a(a + h)}$ **21. (a)** $\frac{1}{2}$

23. -0.25 pie/día **25. (a)** 245 personas/año **(b)** -328.5 personas/año **(c)** 1997–2001 **(d)** 2001–2006 **27. (a)** 7.2 unidades/año **(b)** 8 unidades/año **(c)** -55 unidades/año **(d)** 2000–2001, 2001–2002 **29.** Primeros 20 minutos: 4.05°F/min, siguientes 20 minutos: 1.5°F/min; primer intervalo

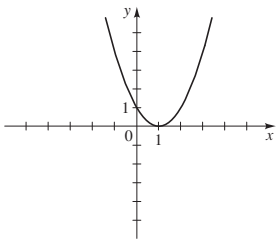
SECCIÓN 2.5 ■ PÁGINA 187

1. (a) arriba **(b)** izquierda **2. (a)** abajo **(b)** derecha **3. (a)** eje x **(b)** eje y **4. (a)** II **(b)** IV **(c)** I **(d)** III **5. (a)** Se desplaza hacia abajo 5 unidades **(b)** Se desplaza a la derecha 5 unidades **7. (a)** Se refleja en el eje x **(b)** Se refleja en el eje y **9. (a)** Se refleja en el eje x, luego se desplaza hacia arriba 5 unidades **(b)** Se estira verticalmente en un factor de 3, luego se desplaza hacia abajo 5 unidades **11. (a)** Se desplaza a la izquierda 1 unidad, se estira verticalmente en un factor de 2, luego se desplaza hacia abajo 3 unidades **(b)** Se desplaza a la derecha 1 unidad, se estira verticalmente en un factor de 2, luego se desplaza hacia arriba 3 unidades **13. (a)** Se contrae horizontalmente en un factor de $\frac{1}{4}$ **(b)** Se estira horizontalmente en un factor de 4 **15. (a)** Se desplaza a la izquierda 2 unidades **(b)** Se desplaza hacia arriba 2 unidades **17. (a)** Se desplaza a la izquierda 2 unidades, luego se desplaza hacia abajo 2 unidades **(b)** Se desplaza a la derecha 2 unidades, luego se desplaza hacia arriba 2 unidades

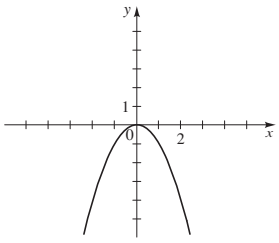
19. (a)



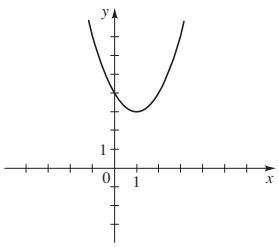
(b)



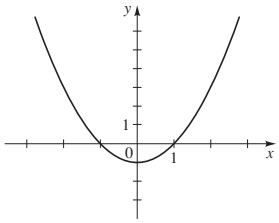
(c)



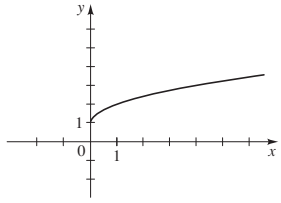
(d)



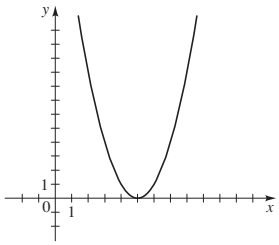
21.



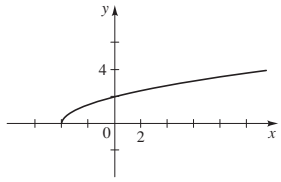
23.



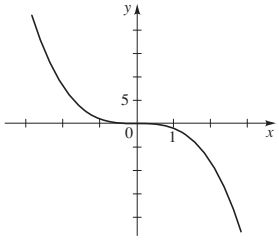
25.



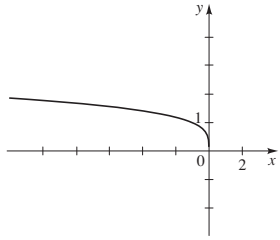
27.



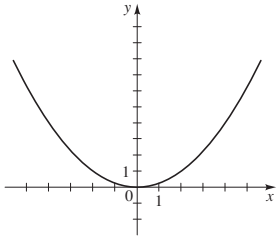
29.



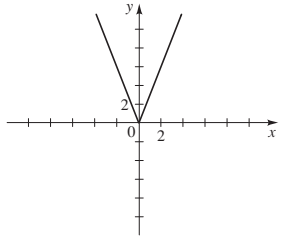
31.



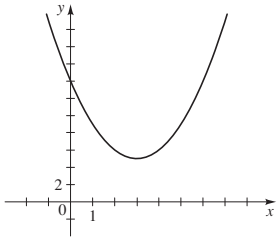
33.



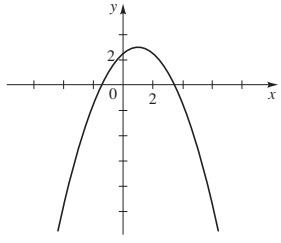
35.



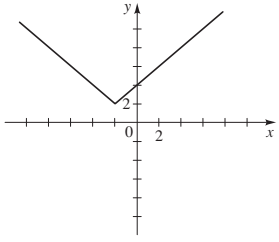
37.



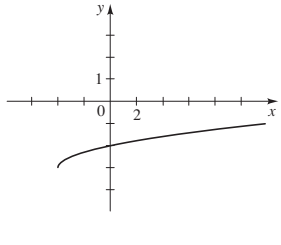
39.



41.



43.



45. $f(x) = x^2 + 3$ **47.** $f(x) = \sqrt{x+2}$

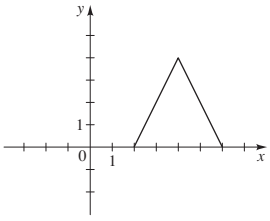
49. $f(x) = |x-3| + 1$ **51.** $f(x) = \sqrt[4]{-x} + 1$

53. $f(x) = 2(x-3)^2 - 2$ **55.** $g(x) = (x-2)^2$

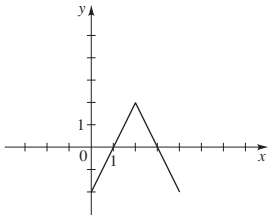
57. $g(x) = |x+1| + 2$ **59.** $g(x) = -\sqrt{x+2}$

61. **(a)** 3 **(b)** 1 **(c)** 2 **(d)** 4

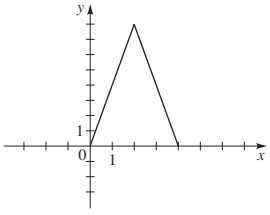
63. **(a)**



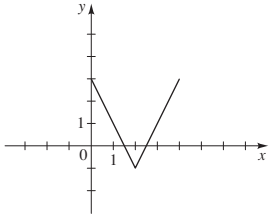
(b)



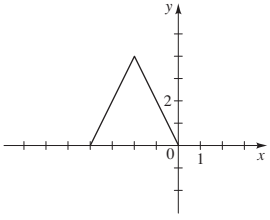
(c)



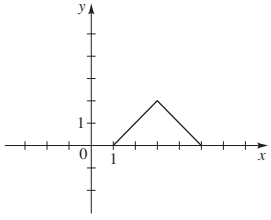
(d)



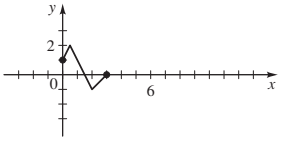
(e)



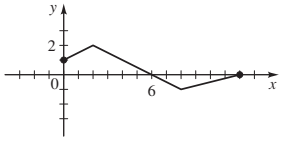
(f)



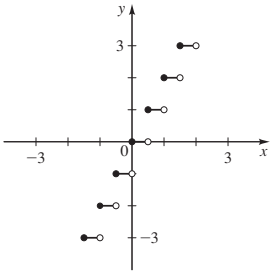
65. **(a)**



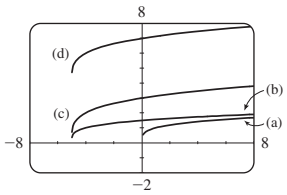
(b)



67.

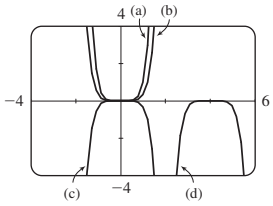


69.



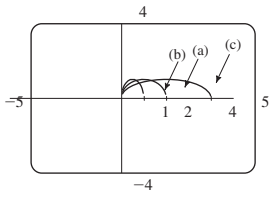
Para el inciso (b) desplace la gráfica en (a) a la izquierda 5 unidades; para el inciso (c) desplace la gráfica en (a) a la izquierda 5 unidades y estire verticalmente en un factor de 2; para el inciso (d) desplace la gráfica en (a) a la izquierda 5 unidades, estire verticalmente en un factor de 2 y luego desplace hacia arriba 4 unidades.

71.



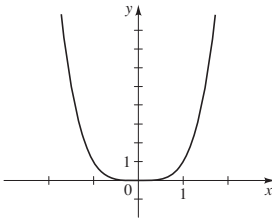
Para el inciso (b) contraiga la gráfica en (a) verticalmente en un factor de $\frac{1}{3}$; para el inciso (c) contraiga la gráfica en (a) verticalmente en un factor de $\frac{1}{3}$ y refleje en el eje x; para el inciso (d) desplace la gráfica en (a) a la derecha 4 unidades, contraiga verticalmente en un factor de $\frac{1}{3}$, y luego refleje en el eje x.

73.



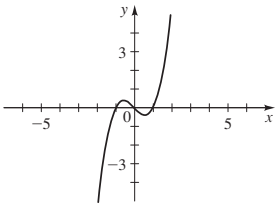
La gráfica del inciso (b) está contraída horizontalmente en un factor de $\frac{1}{2}$ y la gráfica en el inciso (c) está estirada por un factor de 2.

75. Par



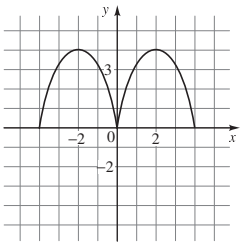
77. Ninguno

79. Impar

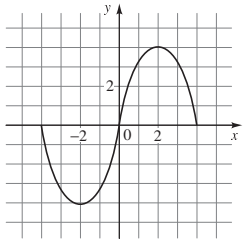


81. Ninguno

83. **(a)**

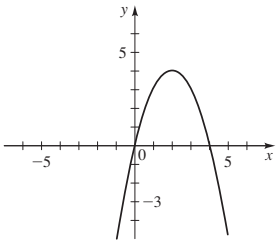


(b)

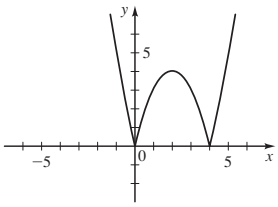


85. Para obtener la gráfica de g, refleje en el eje x el inciso de la gráfica de f que está abajo del eje x.

87. (a)



(b)



89. (a) Desplace hacia arriba 4 unidades, contraiga verticalmente en un factor de 0.01 **(b)** Desplace a la derecha 10 unidades; $g(t) = 4 + 0.01(t - 10)^2$

SECCIÓN 2.6 ■ PÁGINA 196

1. $8, -2, 15, \frac{3}{5}$ **2.** $f(g(x)), 12$ **3.** Multiplique por 2, luego sume 1; Sume 1, luego multiplique por 2 **4.** $x + 1, 2x, 2x + 1, 2(x + 1)$

5. $(f + g)(x) = x^2 + x - 3, (-\infty, \infty)$;
$(f - g)(x) = -x^2 + x - 3, (-\infty, \infty)$;
$(fg)(x) = x^3 - 3x^2, (-\infty, \infty)$;
$\left(\frac{f}{g}\right)(x) = \frac{x - 3}{x^2}, (-\infty, 0) \cup (0, \infty)$

7. $(f + g)(x) = \sqrt{4 - x^2} + \sqrt{1 + x}, [-1, 2]$;
$(f - g)(x) = \sqrt{4 - x^2} - \sqrt{1 + x}, [-1, 2]$;
$(fg)(x) = \sqrt{-x^3 - x^2 + 4x + 4}, [-1, 2]$;
$\left(\frac{f}{g}\right)(x) = \sqrt{\frac{4 - x^2}{1 + x}}, (-1, 2]$

9. $(f + g)(x) = \frac{6x + 8}{x^2 + 4x}, x \neq -4, x \neq 0$;

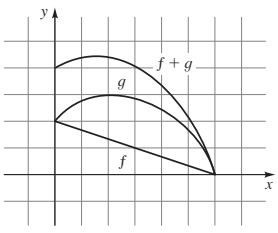
$(f - g)(x) = \frac{-2x + 8}{x^2 + 4x}, x \neq -4, x \neq 0$;

$(fg)(x) = \frac{8}{x^2 + 4x}, x \neq -4, x \neq 0$;

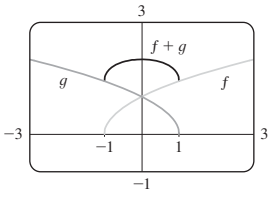
$\left(\frac{f}{g}\right)(x) = \frac{x + 4}{2x}, x \neq -4, x \neq 0$

11. $[0, 1]$ **13.** $(3, \infty)$

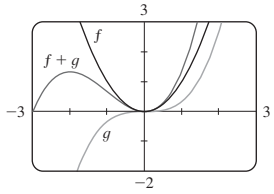
15.



17.



19.



21. (a) 1 **(b)** -23 **23. (a)** -11 **(b)** -119
25. (a) $-3x^2 + 1$ **(b)** $-9x^2 + 30x - 23$
27. 4 **29.** 5 **31.** 4
33. $(f \circ g)(x) = 8x + 1, (-\infty, \infty)$;
$(g \circ f)(x) = 8x + 11, (-\infty, \infty)$; $(f \circ f)(x) = 4x + 9, (-\infty, \infty)$;
$(g \circ g)(x) = 16x - 5, (-\infty, \infty)$
35. $(f \circ g)(x) = (x + 1)^2, (-\infty, \infty)$;
$(g \circ f)(x) = x^2 + 1, (-\infty, \infty)$; $(f \circ f)(x) = x^4, (-\infty, \infty)$;
$(g \circ g)(x) = x + 2, (-\infty, \infty)$
37. $(f \circ g)(x) = \frac{1}{2x + 4}, x \neq -2$; $(g \circ f)(x) = \frac{2}{x} + 4, x \neq 0$;
$(f \circ f)(x) = x, x \neq 0$, $(g \circ g)(x) = 4x + 12, (-\infty, \infty)$
39. $(f \circ g)(x) = |2x + 3|, (-\infty, \infty)$;
$(g \circ f)(x) = 2|x| + 3, (-\infty, \infty)$; $(f \circ f)(x) = |x|, (-\infty, \infty)$;
$(g \circ g)(x) = 4x + 9, (-\infty, \infty)$
41. $(f \circ g)(x) = \frac{2x - 1}{2x}, x \neq 0$; $(g \circ f)(x) = \frac{2x}{x + 1} - 1, x \neq -1$;
$(f \circ f)(x) = \frac{x}{2x + 1}, x \neq -1, x \neq -\frac{1}{2}$;
$(g \circ g)(x) = 4x - 3, (-\infty, \infty)$
43. $(f \circ g)(x) = \frac{1}{x + 1}, x \neq -1, x \neq 0$; $(g \circ f)(x) = \frac{x + 1}{x}$,
$x \neq -1, x \neq 0$; $(f \circ f)(x) = \frac{x}{2x + 1}, x \neq -1, x \neq -\frac{1}{2}$;
$(g \circ g)(x) = x, x \neq 0$
45. $(f \circ g \circ h)(x) = \sqrt{x - 1} - 1$
47. $(f \circ g \circ h)(x) = (\sqrt{x} - 5)^4 + 1$
49. $g(x) = x - 9, f(x) = x^5$
51. $g(x) = x^2, f(x) = x/(x + 4)$
53. $g(x) = 1 - x^3, f(x) = |x|$
55. $h(x) = x^2, g(x) = x + 1, f(x) = 1/x$
57. $h(x) = \sqrt[3]{x}, g(x) = 4 + x, f(x) = x^9$
59. $R(x) = 0.15x - 0.000002x^2$
61. (a) $g(t) = 60t$ **(b)** $f(r) = \pi r^2$ **(c)** $(f \circ g)(t) = 3600\pi t^2$
63. $A(t) = 16\pi t^2$ **65. (a)** $f(x) = 0.9x$ **(b)** $g(x) = x - 100$
(c) $(f \circ g)(x) = 0.9x - 90$, $(g \circ f)(x) = 0.9x - 100$, $f \circ g$: primero rebaja, luego descuento, $g \circ f$: primero descuento, luego rebaja, $g \circ f$ es el mejor trato

SECCIÓN 2.7 ■ PÁGINA 204

1. diferente, Recta Horizontal **2. (a)** uno a uno, $g(x) = x^3$ **(b)** $g^{-1}(x) = x^{1/3}$ **3. (a)** Tome la raíz cúbica, reste 5, luego divida el resultado entre 3 **(b)** $f(x) = (3x + 5)^3, f^{-1}(x) = \dfrac{x^{1/3} - 5}{3}$

4. (a) Falso **(b)** Verdadero **5.** No **7.** Sí **9.** No **11.** Sí **13.** Sí **15.** No **17.** No **19.** No **21. (a)** 2 **(b)** 3 **23.** 1

37. $f^{-1}(x) = \frac{1}{2}(x - 1)$ **39.** $f^{-1}(x) = \frac{1}{4}(x - 7)$

41. $f^{-1}(x) = \sqrt[3]{\frac{1}{4}(5 - x)}$ **43.** $f^{-1}(x) = (1/x) - 2$

45. $f^{-1}(x) = \dfrac{4x}{1 - x}$ **47.** $f^{-1}(x) = \dfrac{7x + 5}{x - 2}$

49. $f^{-1}(x) = (5x - 1)/(2x + 3)$

51. $f^{-1}(x) = \frac{1}{5}(x^2 - 2), x \geq 0$

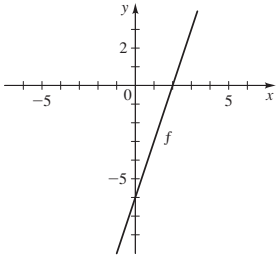
53. $f^{-1}(x) = \sqrt{4 - x}, x \leq 4$

55. $f^{-1}(x) = (x - 4)^3$

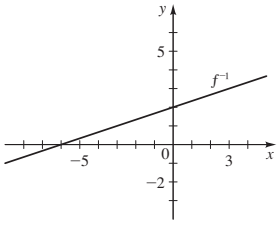
57. $f^{-1}(x) = x^2 - 2x, x \geq 1$

59. $f^{-1}(x) = \sqrt[4]{x}$

61. (a)

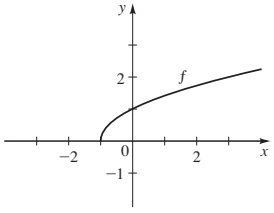


(b)

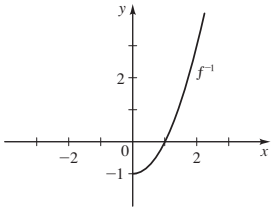


(c) $f^{-1}(x) = \frac{1}{3}(x + 6)$

63. (a)

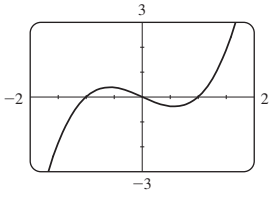


(b)

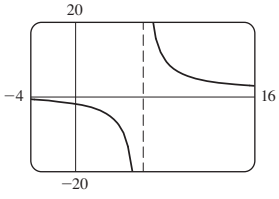


(c) $f^{-1}(x) = x^2 - 1, x \geq 0$

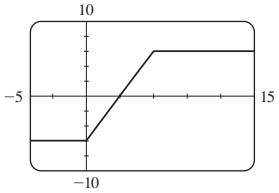
65. No es uno a uno



67. Uno a uno

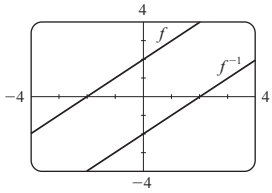


69. No es uno a uno



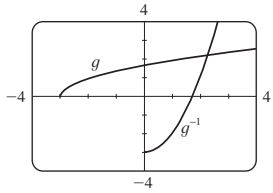
71. (a) $f^{-1}(x) = x - 2$

(b)



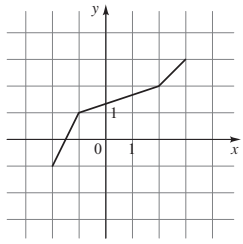
73. (a) $g^{-1}(x) = x^2 - 3, x \geq 0$

(b)



75. $x \geq 0, f^{-1}(x) = \sqrt{4 - x}$ **77.** $x \geq -2, h^{-1}(x) = \sqrt{x} - 2$

79.



81. (a) $f(x) = 500 + 80x$ **(b)** $f^{-1}(x) = \frac{1}{80}(x - 500)$, el número de horas trabajadas como función de la tarifa **(c)** 9; si cobra \$1220, trabajó 9 horas

83. (a) $v^{-1}(t) = \sqrt{0.25 - \dfrac{t}{18{,}500}}$ **(b)** 0.498; a una distancia de 0.498 del eje central la velocidad es 30

85. (a) $F^{-1}(x) = \frac{5}{9}(x - 32)$; la temperatura Celsius cuando la temperatura Fahrenheit es x **(b)** $F^{-1}(86) = 30$; cuando la temperatura es 86° F, es 30°C

87. (a) $f(x) = \begin{cases} 0.1x & \text{si } 0 \leq x \leq 20{,}000 \\ 2000 + 0.2(x - 20{,}000) & \text{si } x > 20{,}000 \end{cases}$

(b) $f^{-1}(x) = \begin{cases} 10x & \text{si } 0 \leq x \leq 2000 \\ 10{,}000 + 5x & \text{si } x > 2000 \end{cases}$

Si usted paga x euros (€) en impuestos, su ingreso es $f^{-1}(x)$.

(c) $f^{-1}(10{,}000) = €\,60{,}000$

89. $f^{-1}(x) = \frac{1}{2}(x - 7)$. Una pizza que cuesta x dólares tiene $f^{-1}(x)$ de aderezo.

REPASO DEL CAPÍTULO 2 ■ PÁGINA 208

1. $f(x) = x^2 - 5$ **3.** Sume 10, luego multiplique el resultado por 3

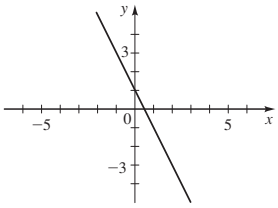
5.

x	$g(x)$
−1	5
0	0
1	−3
2	−4
3	−3

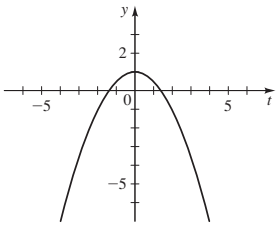
7. (a) $C(1000) = 34{,}000, C(10{,}000) = 205{,}000$ **(b)** Los costos de imprimir 1000 y 10,000 copias del libro **(c)** $C(0) = 5000$; costos fijos **9.** 6, 2, 18, $a^2 - 4a + 6$, $a^2 + 4a + 6$, $x^2 - 2x + 3$, $4x^2 - 8x + 6$, $2x^2 - 8x + 10$ **11. (a)** No es una función **(b)** Función **(c)** Función, uno a uno **(d)** No es una función **13.** Dominio $[-3, \infty)$, rango $[0, \infty)$ **15.** $(-\infty, \infty)$

17. $[-4, \infty)$ **19.** $\{x \mid x \neq -2, -1, 0\}$ **21.** $(-\infty, -1] \cup [1, 4]$

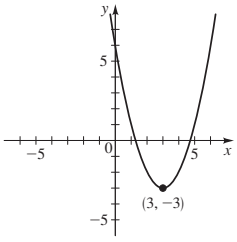
23.



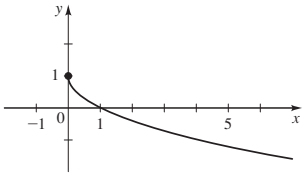
25.



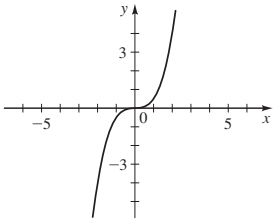
27.



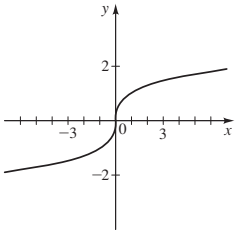
29.



31.



33.



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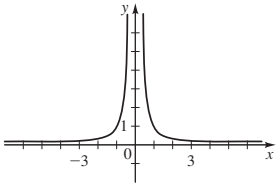
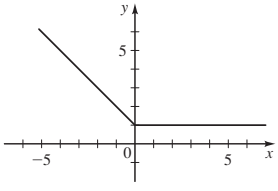
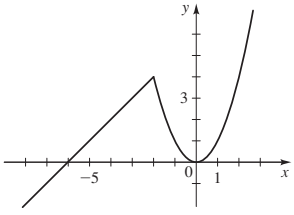


37.

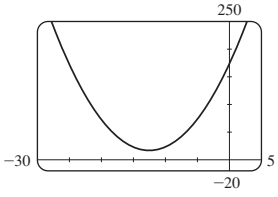


39.

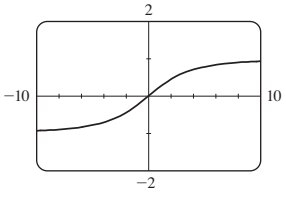


41. No **43.** Sí **45.** (iii)

47.

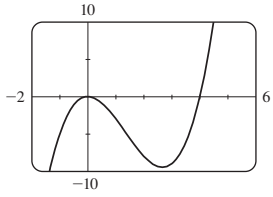


49.



51. $[-2.1, 0.2] \cup [1.9, \infty)$

53.



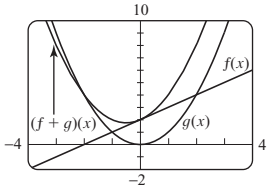
Creciente sobre $(-\infty, 0]$, $[2.67, \infty)$; decreciente sobre $[0, 2.67]$

55. 5 **57.** $\dfrac{-1}{3(3+h)}$ **59.** **(a)** $P(10) = 5010$, $P(20) = 7040$; las poblaciones en 1995 y 2005 **(b)** 203 habitantes/año; promedio anual de aumento de población. **61.** **(a)** $\frac{1}{2}, \frac{1}{2}$ **(b)** Sí, porque es una función lineal **63.** **(a)** Se desplaza hacia arriba 8 unidades **(b)** Se desplaza a la izquierda 8 unidades **(c)** Se estira verticalmente en un factor de 2, luego se desplaza hacia arriba 1 unidad **(d)** Se desplaza a la derecha 2 unidades y hacia abajo 2 unidades **(e)** Se refleja en el eje y **(f)** Se refleja en el eje y, luego en el eje x **(g)** Se refleja en el eje x **(h)** Se refleja en la recta $y = x$

65. **(a)** Ninguna **(b)** Impar **(c)** Par **(d)** Ninguna

67. $g(-1) = -7$ **69.** 68 pies **71.** Máximo local ≈ 3.79 cuando $x \approx 0.46$; mínimo local ≈ 2.81 cuando $x \approx -0.46$

73.



75. **(a)** $(f+g)(x) = x^2 - 6x + 6$

(b) $(f-g)(x) = x^2 - 2$

(c) $(fg)(x) = -3x^3 + 13x^2 - 18x + 8$

(d) $(f/g)(x) = (x^2 - 3x + 2)/(4 - 3x)$

(e) $(f \circ g)(x) = 9x^2 - 15x + 6$

(f) $(g \circ f)(x) = -3x^2 + 9x - 2$

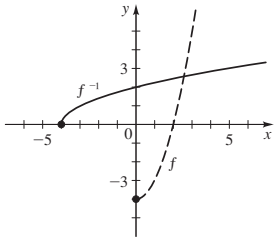
77. $(f \circ g)(x) = -3x^2 + 6x - 1, (-\infty, \infty)$;
$(g \circ f)(x) = -9x^2 + 12x - 3, (-\infty, \infty)$;
$(f \circ f)(x) = 9x - 4, (-\infty, \infty)$;
$(g \circ g)(x) = -x^4 + 4x^3 - 6x^2 + 4x, (-\infty, \infty)$

79. $(f \circ g \circ h)(x) = 1 + \sqrt{x}$ **81.** Sí **83.** No

85. No **87.** $f^{-1}(x) = \dfrac{x+2}{3}$

89. $f^{-1}(x) = \sqrt[3]{x} - 1$

91. **(a), (b)**



(c) $f^{-1}(x) = \sqrt{x+4}$

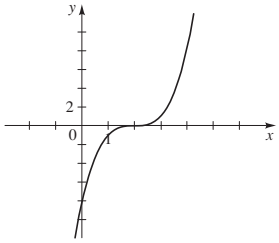
EXAMEN DEL CAPÍTULO 2 ■ PÁGINA 211

1. (a) y (b) son gráficas de funciones, (a) es uno a uno
2. **(a)** $2/3,\ \sqrt{6}/5,\ \sqrt{a}/(a-1)$ **(b)** $[-1, 0) \cup (0, \infty)$
3. **(a)** $f(x) = (x-2)^3$

(b)

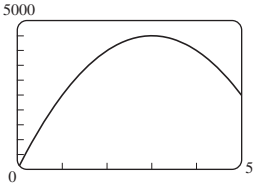
x	$f(x)$
-1	-27
0	-8
1	-1
2	0
3	1
4	8

(c)



(d) Por la Prueba de la Recta Horizontal; tome la raíz cúbica, luego sume 2 **(e)** $f^{-1}(x) = x^{1/3} + 2$ **4.** **(a)** $R(2) = 4000, R(4) = 4000$; ingresos totales de ventas con precios de \$2 y \$4

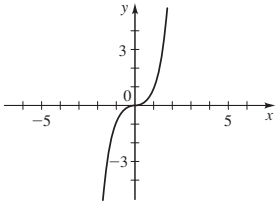
(b)



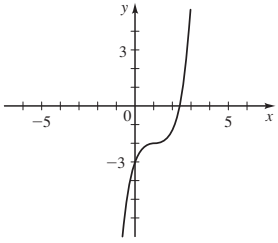
El ingreso aumenta hasta que el precio llega a \$3, luego disminuye

(c) \$4500; \$3 **5.** 5

6. **(a)**

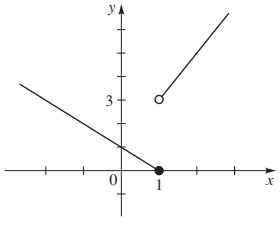


(b)



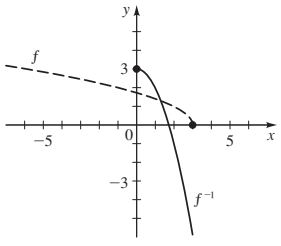
7. **(a)** Se desplaza a la derecha 3 unidades, luego se desplaza hacia arriba 2 unidades **(b)** Se refleja en el eje y

8. **(a)** 3, 0 **(b)**



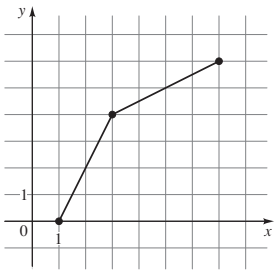
9. **(a)** $(f \circ g)(x) = (x-3)^2 + 1$ **(b)** $(g \circ f)(x) = x^2 - 2$
(c) 2 **(d)** 2 **(e)** $(g \circ g \circ g)(x) = x - 9$
10. **(a)** $f^{-1}(x) = 3 - x^2,\ x \geq 0$

(b)



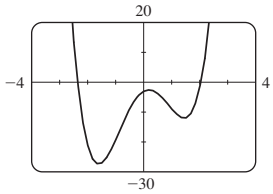
11. **(a)** Dominio $[0, 6]$, rango $[1, 7]$

(b)



(c) $\frac{5}{4}$

12. **(a)**



(b) No

(c) Mínimo local ≈ -27.18 cuando $x \approx -1.61$;
máximo local ≈ -2.55 cuando $x \approx 0.18$;
mínimo local ≈ -11.93 cuando $x \approx 1.43$ **(d)** $[-27.18, \infty)$
(e) Creciente sobre $[-1.61, 0.18] \cup [1.43, \infty)$; decreciente sobre $(-\infty, -1.61] \cup [0.18, 1.43]$

ENFOQUE SOBRE MODELADO ■ PÁGINA 218

1. $A(w) = 3w^2,\ w > 0$ **3.** $V(w) = \frac{1}{2}w^3,\ w > 0$
5. $A(x) = 10x - x^2,\ 0 < x < 10$
7. $A(x) = (\sqrt{3}/4)x^2,\ x > 0$
9. $r(A) = \sqrt{A/\pi},\ A > 0$
11. $S(x) = 2x^2 + 240/x,\ x > 0$
13. $D(t) = 25t,\ t \geq 0$
15. $A(b) = b\sqrt{4-b},\ 0 < b < 4$
17. $A(h) = 2h\sqrt{100 - h^2},\ 0 < h < 10$
19. **(b)** $p(x) = x(19 - x)$ **(c)** 9.5, 9.5
21. **(b)** $A(x) = x(2400 - 2x)$ **(c)** 600 pies por 1200 pies
23. **(a)** $f(w) = 8w + 7200/w$
(b) El ancho a lo largo del camino es 30 pies, la longitud es 40 pies
(c) 15 pies a 60 pies **25.** **(a)** $A(x) = 15x - \left(\dfrac{\pi + 4}{8}\right)x^2$
(b) Ancho ≈ 8.40 pies, altura de el inciso rectangular ≈ 4.20 pies
27. **(a)** $A(x) = x^2 + 48/x$ **(b)** Altura ≈ 1.44 pies, ancho ≈ 2.88 pies
29. **(a)** $A(x) = 2x + \dfrac{200}{x}$ **(b)** 10 m por 10 m
31. **(b)** Al punto C, 5.1 millas desde B

CAPÍTULO 3

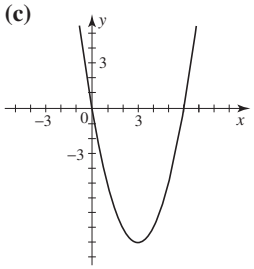
SECCIÓN 3.1 ■ PÁGINA 229

1. cuadrado **2.** **(a)** (h, k) **(b)** hacia arriba, mínimo
(c) hacia abajo, máximo
3. hacia arriba, $(3, 5)$, 5, mínimo
4. hacia abajo, $(3, 5)$, 5, máximo
5. **(a)** $(3, 4)$ **(b)** 4 **(c)** $\mathbb{R}, (-\infty, 4]$
7. **(a)** $(1, -3)$ **(b)** -3 **(c)** $\mathbb{R}, [-3, \infty)$

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

(b) Vértice $(3, -9)$
puntos intersección x 0, 6
punto de intersección y 0

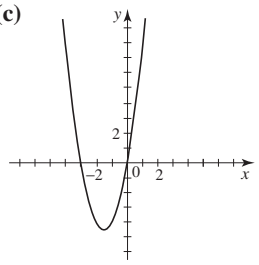
(c)



11. **(a)** $f(x) = 2\left(x + \frac{3}{2}\right)^2 - \frac{9}{2}$

(b) Vértice $\left(-\frac{3}{2}, -\frac{9}{2}\right)$
puntos intersección x -3,
punto de intersección y 0

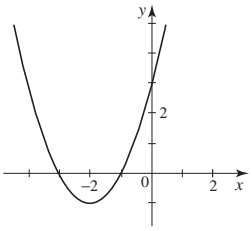
(c)



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

(b) Vértice $(-2, -1)$, puntos intersección x -1, -3, punto de intersección y 3

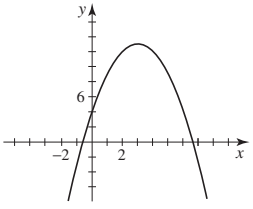
(c)



15. **(a)** $f(x) = -(x - 3)^2 + 13$

(b) Vértice $(3, 13)$; puntos intersección x $3 \pm \sqrt{13}$; punto de intersección y 4

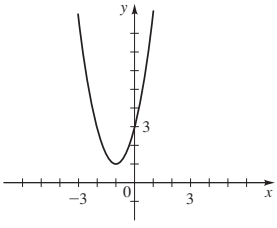
(c)



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

(b) Vértice $(-1, 1)$; no hay puntos intersección x; punto de intersección y 3

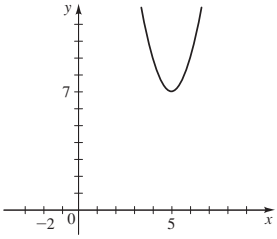
(c)



19. **(a)** $f(x) = 2(x - 5)^2 + 7$

(b) Vértice $(5, 7)$; no hay puntos intersección x; punto de intersección y 57

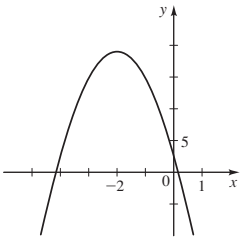
(c)



21. **(a)** $f(x) = -4(x + 2)^2 + 19$

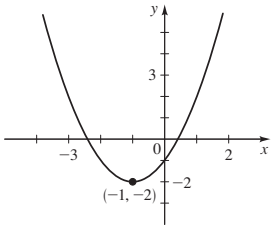
(b) Vértice $(-2, 19)$; puntos intersección x $-2 \pm \frac{1}{2}\sqrt{19}$; punto de intersección y 3

(c)



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

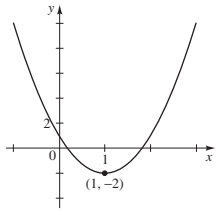
(b)



(c) Mínimo $f(-1) = -2$

25. **(a)** $f(x) = 3(x - 1)^2 - 2$

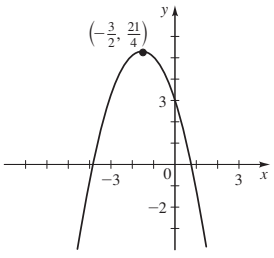
(b)



(c) Mínimo $f(1) = -2$

27. **(a)** $f(x) = -\left(x + \frac{3}{2}\right)^2 + \frac{21}{4}$

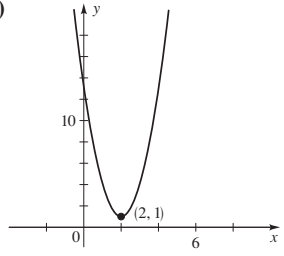
(b)



(c) Máximo $f\left(-\frac{3}{2}\right) = \frac{21}{4}$

29. **(a)** $g(x) = 3(x - 2)^2 + 1$

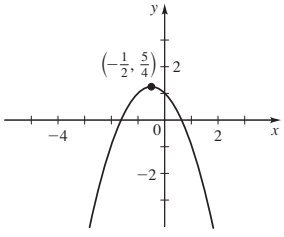
(b)



(c) Mínimo $g(2) = 1$

31. **(a)** $h(x) = -\left(x + \frac{1}{2}\right)^2 + \frac{5}{4}$

(b)



(c) Máximo $h\left(-\frac{1}{2}\right) = \frac{5}{4}$

33. Mínimo $f\left(-\frac{1}{2}\right) = \frac{3}{4}$ **35.** Máximo $f(-3.5) = 185.75$

37. Mínimo $f(0.6) = 15.64$ **39.** Mínimo $h(-2) = -8$

41. Máximo $f(-1) = \frac{7}{2}$ **43.** $f(x) = 2x^2 - 4x$

45. $(-\infty, \infty)$, $(-\infty, 1]$ **47.** $(-\infty, \infty)$, $\left[-\frac{23}{2}, \infty\right)$

49. **(a)** -4.01 **(b)** -4.011025

51. Máximo local 2; mínimos locales -1, 0

53. Máximos locales 0, 1; mínimos locales -2, -1

55. Máximo local ≈ 0.38 cuando $x \approx -0.58$;
mínimo local ≈ -0.38 cuando $x \approx 0.58$

57. Máximo local ≈ 0 cuando $x = 0$; mínimo local ≈ -13.61 cuando $x \approx -1.71$; mínimo local ≈ -73.32 cuando $x \approx 3.21$

59. Máximo local ≈ 5.66 cuando $x \approx 4.00$

61. Máximo local ≈ 0.38 cuando $x \approx -1.73$;
mínimo local ≈ -0.38 cuando $x \approx 1.73$ **63.** 25 pies

65. \$4000, 100 unidades **67.** 30 veces **69.** 50 árboles por acre

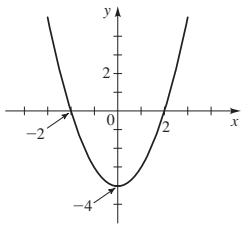
71. 600 pies por 1200 pies **73.** Ancho 8.40 pies, altura de la parte rectangular por 4.20 pies **75. (a)** $f(x) = x(1200 - x)$ **(b)** 600 pies por 600 pies

77. (a) $R(x) = x(57{,}000 - 3000x)$ **(b)** \$9.50 **(c)** \$19.00

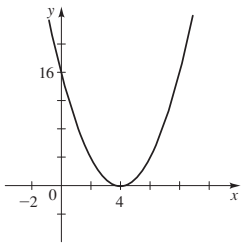
SECCIÓN 3.2 ■ PÁGINA 243

1. II **2. (a)** (ii) **(b)** (iv) **3.** (a), (c) **4.** (a)

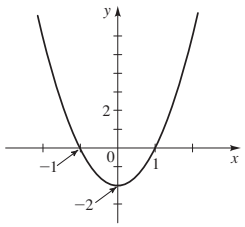
5. (a)



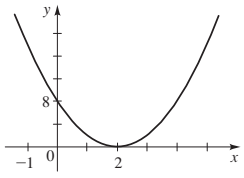
(b)



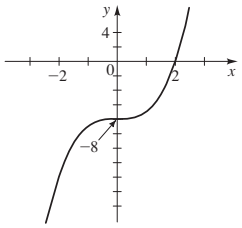
(c)



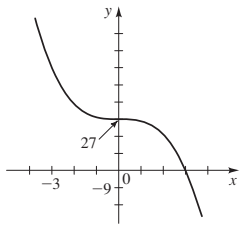
(d)



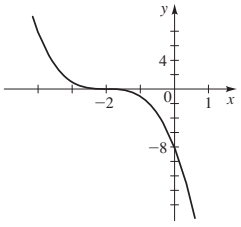
7. (a)



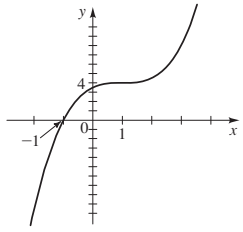
(b)



(c)

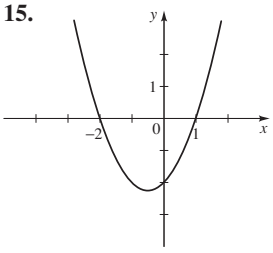


(d)

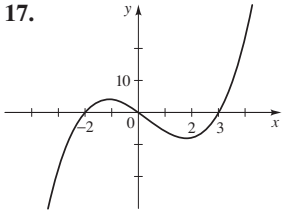


9. III **11.** V **13.** VI

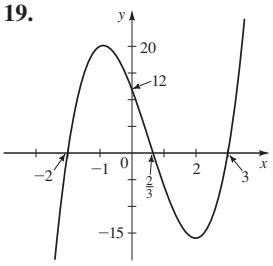
15.



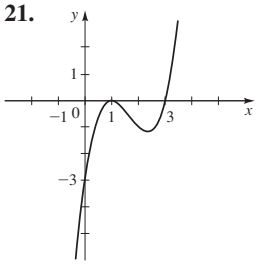
17.



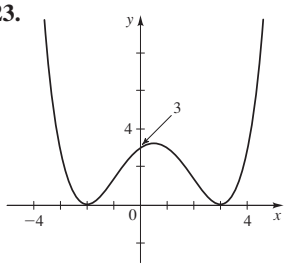
19.



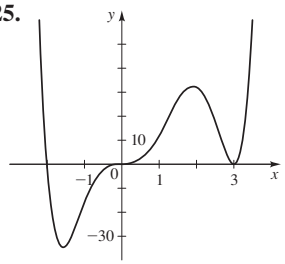
21.



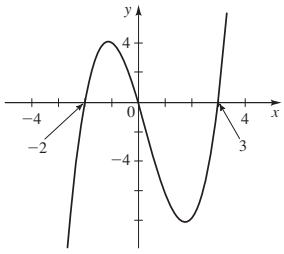
23.



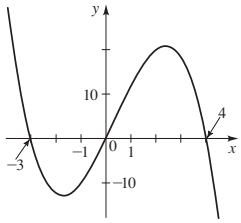
25.



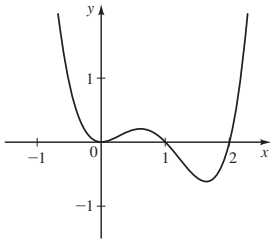
27. $P(x) = x(x + 2)(x - 3)$



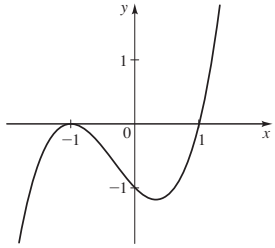
29. $P(x) = -x(x + 3)(x - 4)$



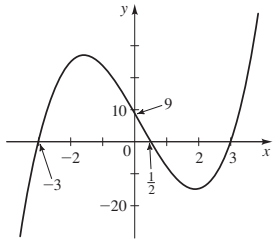
31. $P(x) = x^2(x - 1)(x - 2)$



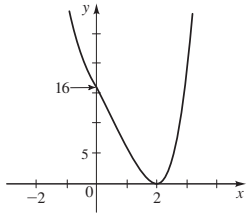
33. $P(x) = (x + 1)^2(x - 1)$



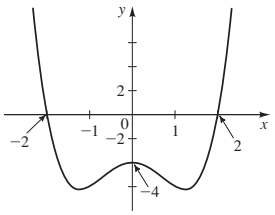
35. $P(x) = (2x - 1)(x + 3)(x - 3)$



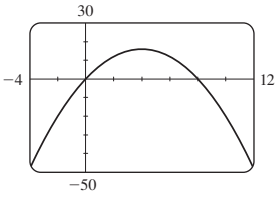
37. $P(x) = (x - 2)^2(x^2 + 2x + 4)$



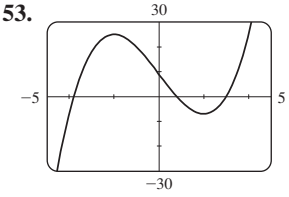
39. $P(x) = (x^2 + 1)(x + 2)(x - 2)$



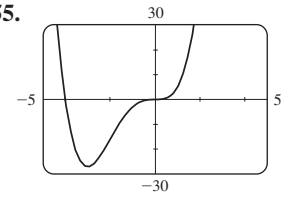
41. $y \to \infty$ cuando $x \to \infty$, $y \to -\infty$ cuando $x \to -\infty$
43. $y \to \infty$ cuando $x \to \pm\infty$
45. $y \to \infty$ cuando $x \to \infty$, $y \to -\infty$ cuando $x \to -\infty$
47. (a) puntos de intersección x 0, 4; punto de intersección y 0 **(b)** $(2, 4)$ **49. (a)** puntos de intersección x -2, 1; punto de intersección y -1 **(b)** $(-1, -2), (1, 0)$
51.



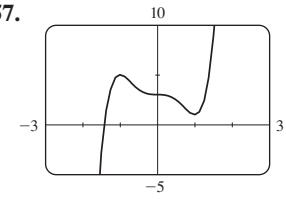
máximo local $(4, 16)$
53.



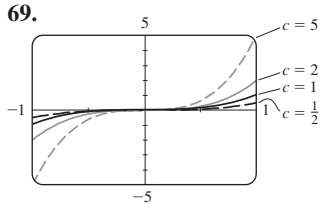
máximo local $(-2, 25)$
mínimo local $(2, -7)$
55.



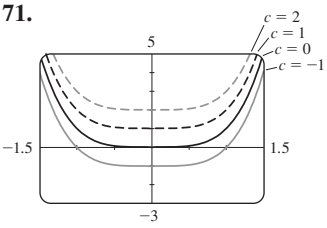
mínimo local $(-3, -27)$
57.



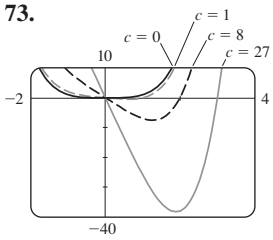
máximo local $(-1, 5)$,
mínimo local $(1, 1)$
59. Un máximo local, no hay mínimo local
61. Un máximo local, un mínimo local
63. Un máximo local, un mínimo local
65. No hay extremos locales
67. Un máximo local, dos mínimos locales
69.



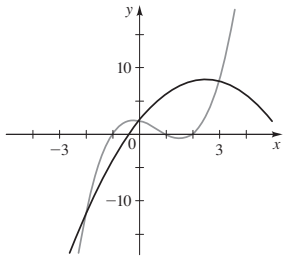
Aumentar el valor de c estira verticalmente la gráfica.
71.



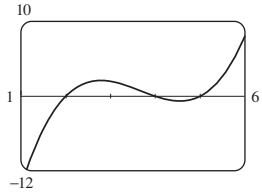
Aumentar el valor de c mueve la gráfica hacia arriba.
73.



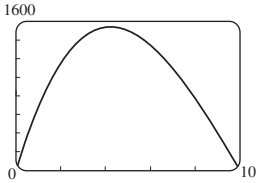
Aumentar el valor de c produce una caída más pronunciada de la gráfica en el cuarto cuadrante y mueve a la derecha el punto de intersección x positivo.
75. (a)



(b) Tres **(c)** $(0, 2), (3, 8), (-2, -12)$
77. (d) $P(x) = P_O(x) + P_E(x)$, donde $P_O(x) = x^5 + 6x^3 - 2x$ y $P_E(x) = -x^2 + 5$
79. (a) Dos extremos locales



81. (a) 26 licuadoras **(b)** No; $3276.22
83. (a) $V(x) = 4x^3 - 120x^2 + 800x$ **(b)** $0 < x < 10$
(c) Volumen máximo ≈ 1539.6 cm^3



SECCIÓN 3.3 ■ PÁGINA 251

1. cociente, residuo **2. (a)** factorice **(b)** k
3. $(x + 3)(3x - 4) + 8$ **5.** $(2x - 3)(x^2 - 1) - 3$
7. $(x^2 + 3)(x^2 - x - 3) + (7x + 11)$
9. $x + 1 + \dfrac{-11}{x + 3}$ **11.** $2x - \dfrac{1}{2} + \dfrac{-\frac{15}{2}}{2x - 1}$
13. $2x^2 - x + 1 + \dfrac{4x - 4}{x^2 + 4}$

En las respuestas 15-37 el primer polinomio dado es el cociente, y el segundo es el residuo
15. $x - 2, -16$ **17.** $2x^2 - 1, -2$ **19.** $x + 2, 8x - 1$
21. $3x + 1, 7x - 5$ **23.** $x^4 + 1, 0$ **25.** $x - 2, -2$
27. $3x + 23, 138$ **29.** $x^2 + 2, -3$ **31.** $x^2 - 3x + 1, -1$
33. $x^4 + x^3 + 4x^2 + 4x + 4, -2$ **35.** $2x^2 + 4x, 1$

37. $x^2 + 3x + 9, 0$ **39.** -3 **41.** 12 **43.** -7 **45.** -483
47. 2159 **49.** $\frac{7}{3}$ **51.** -8.279 **57.** $-1 \pm \sqrt{6}$
59. $x^3 - 3x^2 - x + 3$ **61.** $x^4 - 8x^3 + 14x^2 + 8x - 15$
63. $-\frac{3}{2}x^3 + 3x^2 + \frac{15}{2}x - 9$ **65.** $(x + 1)(x - 1)(x - 2)$
67. $(x + 2)^2(x - 1)^2$

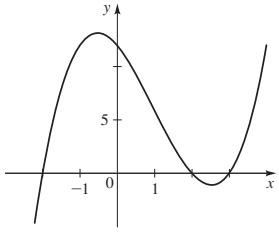
SECCIÓN 3.4 ■ PÁGINA 260

1. a_0, a_n, ± 1, $\pm\frac{1}{2}$, $\pm\frac{1}{3}$, $\pm\frac{1}{6}$, ± 2, $\pm\frac{2}{3}$, ± 5, $\pm\frac{5}{2}$, $\pm\frac{5}{3}$, $\pm\frac{5}{6}$, ± 10, $\pm\frac{10}{3}$
2. 1, 3, 5; 0 **3.** Verdadero **4.** Falso **5.** ± 1, ± 3 **7.** ± 1, ± 2, ± 4, ± 8, $\pm\frac{1}{2}$ **9.** ± 1, ± 7, $\pm\frac{1}{2}$, $\pm\frac{7}{2}$, $\pm\frac{1}{4}$, $\pm\frac{7}{4}$ **11. (a)** ± 1, $\pm\frac{1}{5}$ **(b)** -1, 1, $\frac{1}{5}$ **13. (a)** ± 1, ± 3, $\pm\frac{1}{2}$, $\pm\frac{3}{2}$ **(b)** $-\frac{1}{2}$, 1, 3
15. -2, 1; $P(x) = (x + 2)^2(x - 1)$
17. -1, 2; $P(x) = (x + 1)^2(x - 2)$ **19.** 2; $P(x) = (x - 2)^3$
21. -1, 2, 3; $P(x) = (x + 1)(x - 2)(x - 3)$
23. -3, -1, 1; $P(x) = (x + 3)(x + 1)(x - 1)$
25. ± 1, ± 2; $P(x) = (x - 2)(x + 2)(x - 1)(x + 1)$
27. -4, -2, -1, 1; $P(x) = (x + 4)(x + 2)(x - 1)(x + 1)$
29. ± 2, $\pm\frac{3}{2}$; $P(x) = (x - 2)(x + 2)(2x - 3)(2x + 3)$
31. ± 2, $\frac{1}{3}$, 3; $P(x) = (x - 2)(x + 2)(x - 3)(3x - 1)$
33. -1, $\pm\frac{1}{2}$; $P(x) = (x + 1)(2x - 1)(2x + 1)$
35. $-\frac{3}{2}$, $\frac{1}{2}$, 1; $P(x) = (x - 1)(2x + 3)(2x - 1)$
37. $-\frac{5}{2}$, -1, $\frac{3}{2}$; $P(x) = (x + 1)(2x + 5)(2x - 3)$
39. $-\frac{1}{2}$, $\frac{2}{5}$, $\frac{1}{2}$; $P(x) = (2x - 1)(5x - 2)(2x + 1)$
41. -1, $\frac{1}{2}$, 2; $P(x) = (x + 1)(x - 2)^2(2x - 1)$
43. -3, -2, 1, 3; $P(x) = (x + 3)(x + 2)^2(x - 1)(x - 3)$
45. -1, $-\frac{1}{3}$, 2, 5; $P(x) = (x + 1)^2(x - 2)(x - 5)(3x + 1)$

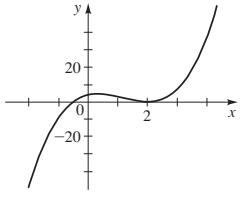
47. -2, $-1 \pm \sqrt{2}$ **49.** -1, 4, $\dfrac{3 \pm \sqrt{13}}{2}$ **51.** 3, $\dfrac{1 \pm \sqrt{5}}{2}$

53. $\frac{1}{2}$, $\dfrac{1 \pm \sqrt{3}}{2}$ **55.** -1, $-\frac{1}{2}$, $-3 \pm \sqrt{10}$

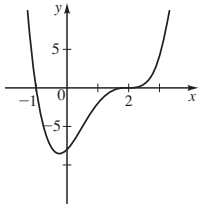
57. (a) -2, 2, 3 **(b)**



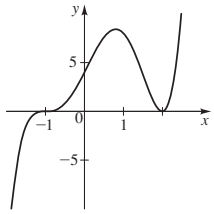
59. (a) $-\frac{1}{2}$, 2 **(b)**



61. (a) -1, 2 **(b)**



63. (a) -1, 2 **(b)**



65. 1 positivo, 2 o 0 negativo; 3 o 1 real **67.** 1 positivo, 1 negativo; 2 real **69.** 2 o 0 positivo, 0 negativo; 3 o 1 real (porque 0 es un cero pero no es positivo ni negativo) **75.** 3, -2 **77.** 3, -1
79. -2, $\frac{1}{2}$, ± 1 **81.** $\pm\frac{1}{2}$, $\pm\sqrt{5}$ **83.** -2, 1, 3, 4 **89.** -2, 2, 3
91. $-\frac{3}{2}$, -1, 1, 4 **93.** -1.28, 1.53 **95.** -1.50 **99.** 11.3 pies
101. (a) Empezó a nevar de nuevo. **(b)** No
(c) Justo antes de la medianoche de la noche del sábado
103. 2.76 m **105.** 88 pulg. (o 3.21 pulg.)

SECCIÓN 3.5 ■ PÁGINA 268

1. -1 **2.** 3, 4 **3. (a)** $3 - 4i$ **(b)** $9 + 16 = 25$ **4.** $3 - 4i$
5. Parte real 5, parte imaginaria -7 **7.** Parte real $-\frac{2}{3}$, parte imaginaria $-\frac{5}{3}$ **9.** Parte real 3, parte imaginaria 0 **11.** Parte real 0, parte imaginaria $-\frac{2}{3}$ **13.** Parte real $\sqrt{3}$, parte imaginaria 2 **15.** $5 - i$
17. $3 + 5i$ **19.** $2 - 2i$ **21.** $-19 + 4i$ **23.** $-4 + 8i$
25. $30 + 10i$ **27.** $-33 - 56i$ **29.** $27 - 8i$ **31.** $-i$ **33.** 1
35. $-i$ **37.** $\frac{8}{5} + \frac{1}{5}i$ **39.** $-5 + 12i$ **41.** $-4 + 2i$ **43.** $2 - \frac{4}{3}i$
45. $-i$ **47.** $5i$ **49.** -6 **51.** $(3 + \sqrt{5}) + (3 - \sqrt{5})i$
53. 2 **55.** $-i\sqrt{2}$ **57.** $\pm 7i$ **59.** $2 \pm i$ **61.** $-1 \pm 2i$
63. $-\dfrac{1}{2} \pm \dfrac{\sqrt{3}}{2}i$ **65.** $\frac{1}{2} \pm \frac{1}{2}i$ **67.** $-\dfrac{3}{2} \pm \dfrac{\sqrt{3}}{2}i$ **69.** $\dfrac{-6 \pm \sqrt{6}i}{6}$
71. $1 \pm 3i$

SECCIÓN 3.6 ■ PÁGINA 276

1. 5, -2, 3, 1 **2. (a)** $x - a$ **(b)** $(x - a)^m$ **3.** n
4. $a - bi$ **5. (a)** 0, $\pm 2i$ **(b)** $x^2(x - 2i)(x + 2i)$
7. (a) 0, $1 \pm i$ **(b)** $x(x - 1 - i)(x - 1 + i)$
9. (a) $\pm i$ **(b)** $(x - i)^2(x + i)^2$
11. (a) ± 2, $\pm 2i$ **(b)** $(x - 2)(x + 2)(x - 2i)(x + 2i)$
13. (a) -2, $1 \pm i\sqrt{3}$ **(b)** $(x + 2)\big(x - 1 - i\sqrt{3}\big)\big(x - 1 + i\sqrt{3}\big)$
15. (a) ± 1, $\frac{1}{2} \pm \frac{1}{2}i\sqrt{3}$, $-\frac{1}{2} \pm \frac{1}{2}i\sqrt{3}$
(b) $(x - 1)(x + 1)\big(x - \frac{1}{2} - \frac{1}{2}i\sqrt{3}\big)\big(x - \frac{1}{2} + \frac{1}{2}i\sqrt{3}\big) \times$
$\big(x + \frac{1}{2} - \frac{1}{2}i\sqrt{3}\big)\big(x + \frac{1}{2} + \frac{1}{2}i\sqrt{3}\big)$

En las respuestas 17-33 se da primeramente la forma factorizada, a continuación se dan los ceros con multiplicidad de cada uno en paréntesis.

17. $(x - 5i)(x + 5i)$; $\pm 5i\,(1)$
19. $[x - (-1 + i)][x - (-1 - i)]$; $-1 + i\,(1)$, $-1 - i\,(1)$
21. $x(x - 2i)(x + 2i)$; $0\,(1)$, $2i\,(1)$, $-2i\,(1)$
23. $(x - 1)(x + 1)(x - i)(x + i)$; $1\,(1)$, $-1\,(1)$, $i\,(1)$, $-i\,(1)$
25. $16\big(x - \frac{3}{2}\big)\big(x + \frac{3}{2}\big)\big(x - \frac{3}{2}i\big)\big(x + \frac{3}{2}i\big)$; $\frac{3}{2}\,(1)$, $-\frac{3}{2}\,(1)$, $\frac{3}{2}i\,(1)$, $-\frac{3}{2}i\,(1)$
27. $(x + 1)(x - 3i)(x + 3i)$; $-1\,(1)$, $3i\,(1)$, $-3i\,(1)$
29. $(x - i)^2(x + i)^2$; $i\,(2)$, $-i\,(2)$
31. $(x - 1)(x + 1)(x - 2i)(x + 2i)$; $1\,(1)$, $-1\,(1)$, $2i\,(1)$, $-2i\,(1)$
33. $x\big(x - i\sqrt{3}\big)^2\big(x + i\sqrt{3}\big)^2$; $0\,(1)$, $i\sqrt{3}\,(2)$, $-i\sqrt{3}\,(2)$
35. $P(x) = x^2 - 2x + 2$ **37.** $Q(x) = x^3 - 3x^2 + 4x - 12$
39. $P(x) = x^3 - 2x^2 + x - 2$

41. $R(x) = x^4 - 4x^3 + 10x^2 - 12x + 5$

43. $T(x) = 6x^4 - 12x^3 + 18x^2 - 12x + 12$

45. $-2, \pm 2i$ **47.** $1, \dfrac{1 \pm i\sqrt{3}}{2}$ **49.** $2, \dfrac{1 \pm i\sqrt{3}}{2}$

51. $-\frac{3}{2}, -1 \pm i\sqrt{2}$ **53.** $-2, 1, \pm 3i$ **55.** $1, \pm 2i, \pm i\sqrt{3}$

57. 3 (multiplicidad 2), $\pm 2i$ **59.** $-\frac{1}{2}$ (multiplicidad 2), $\pm i$

61. 1 (multiplicidad 3), $\pm 3i$ **63. (a)** $(x - 5)(x^2 + 4)$

(b) $(x - 5)(x - 2i)(x + 2i)$ **65. (a)** $(x - 1)(x + 1)(x^2 + 9)$

(b) $(x - 1)(x + 1)(x - 3i)(x + 3i)$

67. (a) $(x - 2)(x + 2)(x^2 - 2x + 4)(x^2 + 2x + 4)$

(b) $(x - 2)(x + 2)[x - (1 + i\sqrt{3})][x - (1 - i\sqrt{3})] \times$
$[x + (1 + i\sqrt{3})][x + (1 - i\sqrt{3})]$ **69. (a)** 4 real

(b) 2 real, 2 imaginaria **(c)** 4 imaginaria

SECCIÓN 3.7 ■ PÁGINA 289

1. $-\infty, \infty$ **2.** 2 **3.** $-1, 2$ **4.** $\frac{1}{3}$ **5.** $-2, 3$ **6.** 1

7. (a) $-3, -19, -199, -1999$; 5, 21, 201, 2001;
1.2500, 1.0417, 1.0204, 1.0020; 0.8333, 0.9615, 0.9804, 0.9980

(b) $r(x) \to -\infty$ cuando $x \to 2^-$; $r(x) \to \infty$ cuando $x \to 2^+$

(c) Asíntota horizontal $y = 1$

9. (a) $-22, -430, -40{,}300, -4{,}003{,}000$;
$-10, -370, -39{,}700, -3{,}997{,}000$;
0.3125, 0.0608, 0.0302, 0.0030;
$-0.2778, -0.0592, -0.0298, -0.0030$

(b) $r(x) \to -\infty$ cuando $x \to 2^-$; $r(x) \to -\infty$ cuando $x \to 2^+$

(c) Asíntota horizontal $y = 0$ **11.** punto de intersección x 1, punto de intersección $y - \frac{1}{4}$ **13.** puntos de intersección $x - 1, 2$; punto de intersección y $\frac{1}{3}$ **15.** puntos de intersección $x - 3, 3$; no hay punto de intersección y **17.** punto de intersección x 3, punto de intersección y 3, vertical $x = 2$; horizontal $y = 2$ **19.** puntos de intersección $-1, 1$; punto de intersección y $\frac{1}{4}$; vertical $x = -2, x = 2$; horizontal $y = 1$

21. Vertical $x = 2$; horizontal $y = 0$ **23.** Horizontal $y = 0$

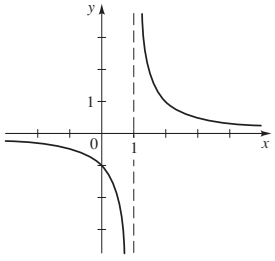
25. Vertical $x = \frac{1}{2}$, $x = -1$; horizontal $y = 3$

27. Vertical $x = \frac{1}{3}$, $x = -2$; horizontal $y = \frac{5}{3}$

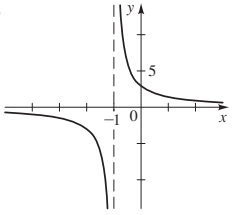
29. Vertical $x = 0$; horizontal $y = 3$

31. Vertical $x = 1$

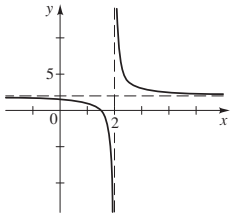
33.



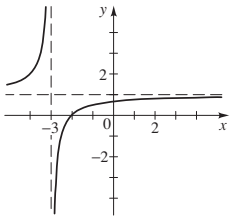
35.



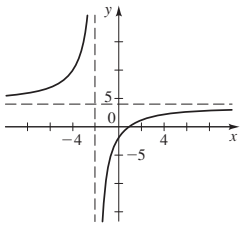
37.



39.

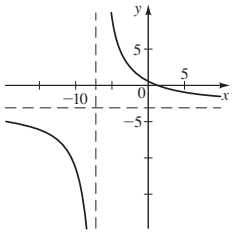


41.



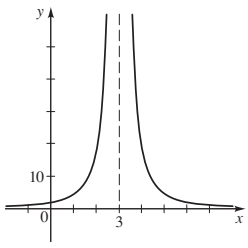
punto de intersección x 1
punto de intersección y -2
vertical $x = -2$
horizontal $y = 4$
dominio $\{x \mid x \neq -2\}$
rango $\{y \mid y \neq 4\}$

43.



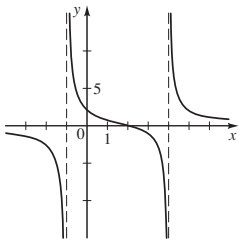
punto de intersección x $\frac{4}{3}$
punto de intersección y $\frac{4}{7}$
vertical $x = -7$
horizontal $y = -3$
dominio $\{x \mid x \neq -7\}$
rango $\{y \mid y \neq -3\}$

45.



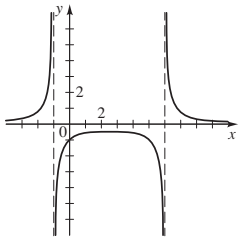
punto de intersección y 2
vertical $x = 3$
horizontal $y = 0$
dominio $\{x \mid x \neq 3\}$
rango $\{y \mid y > 0\}$

47.



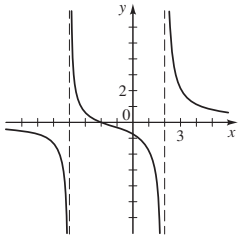
punto de intersección x 2
punto de intersección y 2
vertical $x = -1, x = 4$
horizontal $y = 0$
dominio $\{x \mid x \neq -1, 4\}$
rango $\mathbb{R}$

49.



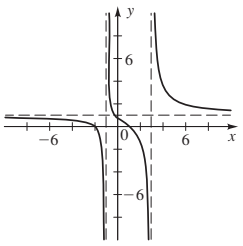
punto de intersección $y - 1$
vertical $x = -1, x = 6$
horizontal $y = 0$
dominio $\{x \mid x \neq -1, 6\}$
rango $\{y \mid y \leq -0.5 \text{ o } y > 0\}$

51.



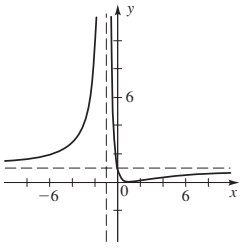
punto de intersección -2
punto de intersección y $-\frac{3}{4}$
vertical $x = -4, x = 2$
horizontal $y = 0$
dominio $\{x \mid x \neq -4, 2\}$
rango $\mathbb{R}$

53.



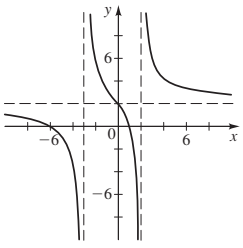
puntos de intersección x $-2, 1$
punto de intersección y $\frac{2}{3}$
vertical $x = -1, x = 3$
horizontal $y = 1$
dominio $\{x \mid x \neq -1, 3\}$
rango $\mathbb{R}$

55.



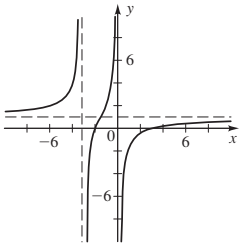
punto de intersección x 1
punto de intersección y 1
vertical $x = -1$
horizontal $y = 1$
dominio $\{x \mid x \neq -1\}$
rango $\{y \mid y \geq 0\}$

57.



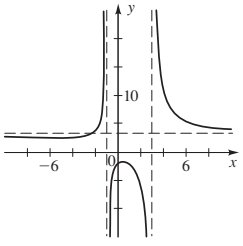
puntos de intersección x $-6, 1$
punto de intersección y 2
vertical $x = -3, x = 2$
horizontal $y = 2$
dominio $\{x \mid x \neq -3, 2\}$
rango $\mathbb{R}$

59.



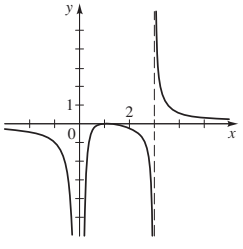
puntos de intersección x $-2, 3$
vertical $x = -3, x = 0$
horizontal $y = 1$
dominio $\{x \mid x \neq -3, 0\}$
rango $\mathbb{R}$

61.



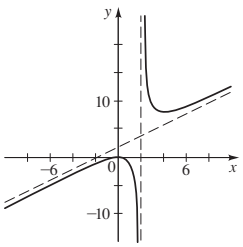
punto de intersección y -2
vertical $x = -1, x = 3$
horizontal $y = 3$
dominio $\{x \mid x \neq -1, 3\}$
rango $\{y \mid y \leq -1.5 \text{ o } y \geq 2.4\}$

63.



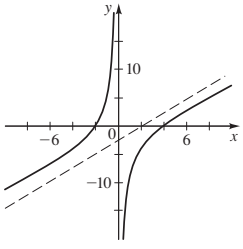
punto de intersección x 1
vertical $x = 0, x = 3$
horizontal $y = 0$
dominio $\{x \mid x \neq 0, 3\}$
rango $\mathbb{R}$

65.



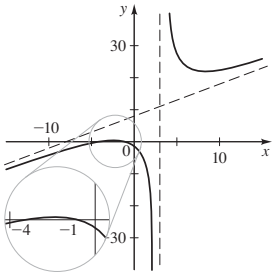
pendiente $y = x + 2$
vertical $x = 2$

67.



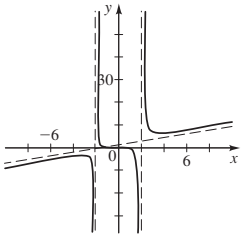
pendiente $y = x - 2$
vertical $x = 0$

69.



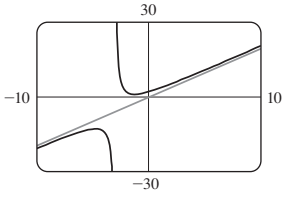
pendiente $y = x + 8$
vertical $x = 3$

71.



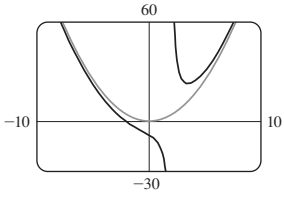
pendiente $y = x + 1$
vertical $x = 2, x = -2$

73.



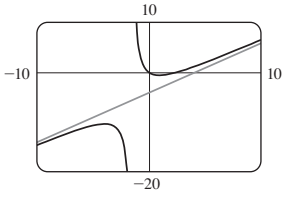
vertical $x = -3$

75.

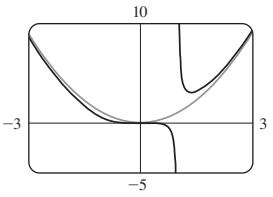


vertical $x = 2$

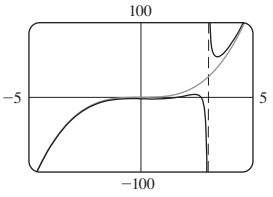
77.



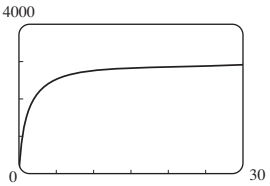
vertical $x = -1.5$
puntos de intersección x 0, 2.5
punto de intersección y 0, local
máximo $(-3.9, -10.4)$
mínimo local $(0.9, -0.6)$
comportamiento final: $y = x - 4$

79. 

vertical $x = 1$
punto de intersección x 0
punto de intersección y 0
mínimo local (1.4, 3.1)
comportamiento final: $y = x^2$

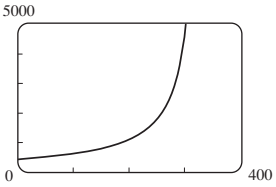
81. 

vertical $x = 3$
puntos de intersección x 1.6, 2.7
punto de intersección y -2
máximos locales $(-0.4, -1.8)$, $(2.4, 3.8)$
mínimo local $(0.6, -2.3)$, $(3.4, 54.3)$
comportamiento final $y = x^3$

83. (a) 

(b) Se nivela en 3000.

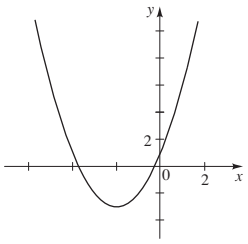
85. (a) 2.50 mg/L **(b)** Disminuye a 0. **(c)** 16.61 h

87. 

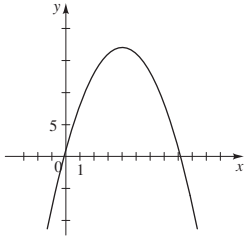
Si la rapidez del tren se aproxima a la rapidez del sonido, entonces la frecuencia aumenta indefinidamente (un estampido sónico).

REPASO DEL CAPÍTULO 3 ■ PÁGINA 292

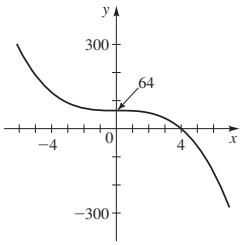
1. (a) $f(x) = (x + 2)^2 - 3$

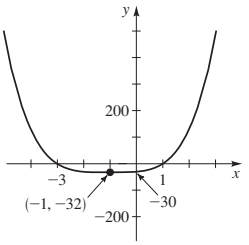
(b) 

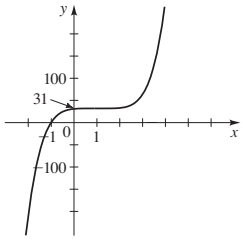
3. (a) $g(x) = -(x - 4)^2 + 17$

(b) 

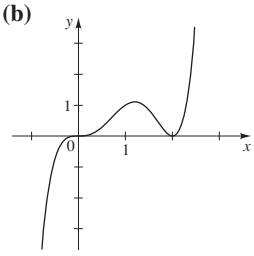
5. Mínimo $f(-1) = -7$ **7.** 68 pies

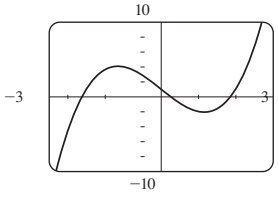
9. 

11. 

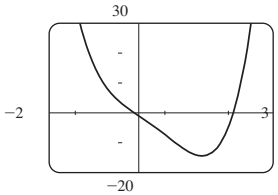
13. 

15. (a) 0 (multiplicidad 3), 2 (multiplicidad 2)

(b) 

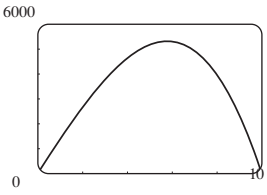
17. 

puntos de intersección x -2.1, 0.3, 1.9
punto de intersección y 1
máximo local $(-1.2, 4.1)$
mínimo local $(1.2, -2.1)$
$y \to \infty$ cuando $x \to \infty$
$y \to -\infty$ cuando $x \to -\infty$

19. 

puntos de intersección x -0.1, 2.1
punto de intersección y -1
mínimo local $(1.4, -14.5)$
$y \to \infty$ cuando $x \to \infty$
$y \to \infty$ cuando $x \to -\infty$

21. (a) $S = 13.8x(\ 100 - {}^{2}x$ **(b)** $0 \le x \le 10$

(c) 

(d) 5.8 pulg.

En las respuestas 23-29 el primer polinomio dado es el cociente, y el segundo es el residuo.

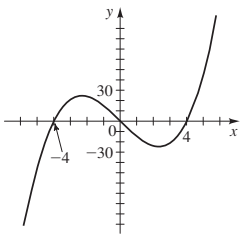
23. $x - 1$, 3 **25.** $x^2 + 3x + 23$, 94

27. $x^3 - 5x^2 + 17x - 83$, 422 **29.** $2x - 3$, 12

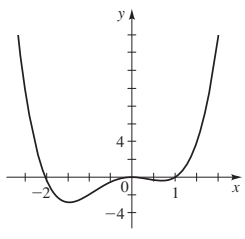
31. 3 **35.** 8 **37. (a)** $\pm 1, \pm 2, \pm 3, \pm 6, \pm 9, \pm 18$

(b) 2 o 0 positivo, 3 o 1 negativo

39. (a) -4, 0, 4

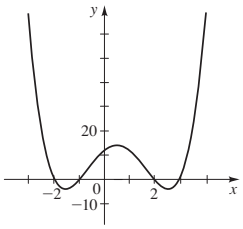
(b) 

41. (a) -2, 0 (multiplicidad 2), 1

(b) 

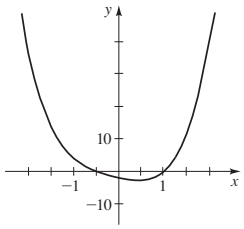
43. **(a)** $-2, -1, 2, 3$

(b)



45. **(a)** $-\frac{1}{2}, 1$

(b)



47. $3 + i$ **49.** $8 - i$ **51.** $\frac{6}{5} + \frac{8}{5}i$ **53.** i **55.** 2

57. $4x^3 - 18x^2 + 14x + 12$ **59.** No; como los complejos conjugados de ceros imaginarios también serán ceros, la polinomial tendría 8 ceros, contradiciendo el requisito de que tiene grado 4.

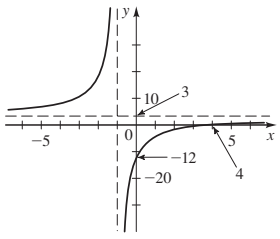
61. $-3, 1, 5$ **63.** $-1 \pm 2i, -2$ (multiplicidad 2)

65. $\pm 2, 1$ (multiplicidad 3) **67.** $\pm 2, \pm 1 \pm i\sqrt{3}$

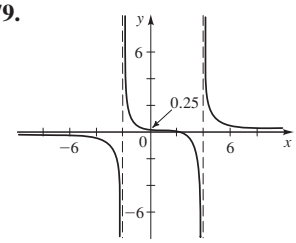
69. $1, 3, \dfrac{-1 \pm i\sqrt{7}}{2}$ **71.** $x = -0.5, 3$ **73.** $x \approx -0.24, 4.24$

75. $2, P(x) = (x - 2)(x^2 + 2x + 2)$

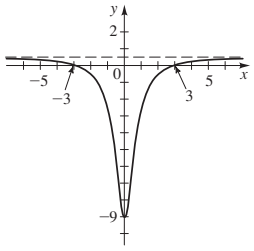
77.



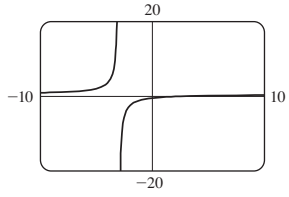
79.



81.

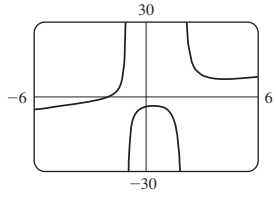


83.



punto de intersección x 3
punto de intersección y −0.5
vertical $x = -3$
horizontal $y = 0.5$
no hay extremos locales

85.

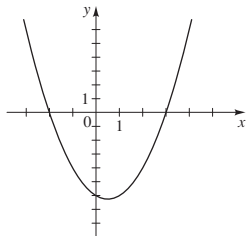


punto de intersección x -2
punto de intersección y -4
vertical $x = -1, x = 2$
pendiente $y = x + 1$
máximo local $(0.425, -3.599)$
mínimo local $(4.216, 7.175)$

87. $(-2, -28), (1, 26), (2, 68), (5, 770)$

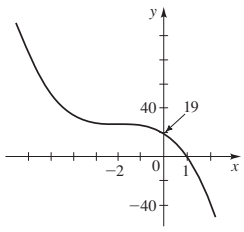
EXAMEN DE CAPÍTULO ■ PÁGINA 295

1. $f(x) = \left(x - \frac{1}{2}\right)^2 - \frac{25}{4}$



2. Mínimo $f\left(-\frac{3}{2}\right) = -\frac{3}{2}$ **3.** **(a)** 2500 pies **(b)** 1000 pies

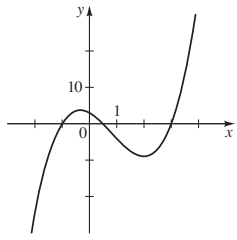
4.



5. **(a)** $x^3 + 2x^2 + 2, 9$ **(b)** $x^3 + 2x^2 + \frac{1}{2}, \frac{15}{2}$

6. **(a)** $\pm 1, \pm 3, \pm\frac{1}{2}, \pm\frac{3}{2}$ **(b)** $2(x - 3)\left(x - \frac{1}{2}\right)(x + 1)$

(c) $-1, \frac{1}{2}, 3$ **(d)**



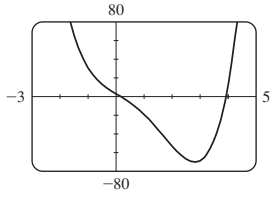
7. **(a)** $7 + i$ **(b)** $-1 - 5i$ **(c)** $18 + i$ **(d)** $\frac{6}{25} - \frac{17}{25}i$

(e) 1 **(f)** $6 - 2i$ **8.** $3, -1 \pm i$ **9.** $(x - 1)^2(x - 2i)(x + 2i)$

10. $x^4 + 2x^3 + 10x^2 + 18x + 9$

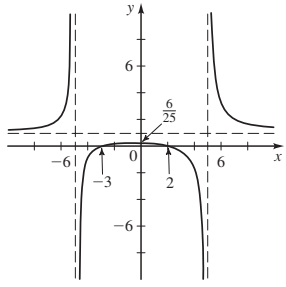
11. **(a)** 4, 2 o 0 positivo; 0 negativo

(c) 0.17, 3.93

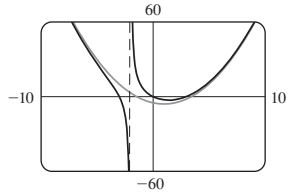


(d) Mínimo local $(2.8, -70.3)$

12. **(a)** r, u **(b)** s **(c)** s **(d)**



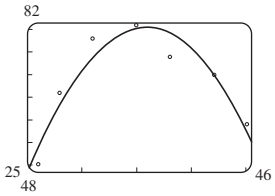
(e) $x^2 - 2x - 5$



ENFOQUE SOBRE MODELADO ■ PÁGINA 298

1. (a) $y = -0.275428x^2 + 19.7485x - 273.5523$

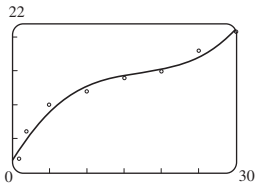
(b)



(c) 35.85 lb/pulg.^{2}

3. (a) $y = 0.00203708x^3 - 0.104521x^2 + 1.966206x + 1.45576$

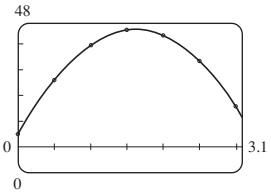
(b)



(c) 43 vegetales **(d)** 2.0 s

5. (a) Grado 2

(b) $y = -16.0x^2 + 51.8429x + 4.20714$



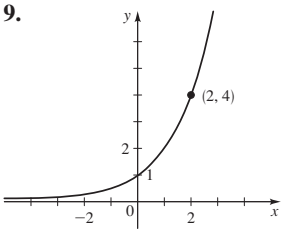
(c) 0.3 s y 2.9 s **(d)** 46.2 pies

CAPÍTULO 4

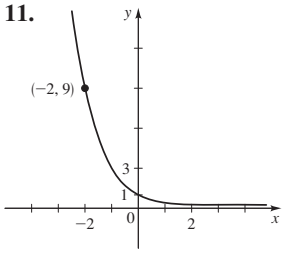
SECCIÓN 4.1 ■ PÁGINA 307

1. 5; $\frac{1}{25}$, 1, 25, 15,625 **2. (a)** III **(b)** I **(c)** II **(d)** IV **3. (a)** hacia abajo **(b)** a la derecha **4.** principal, tasa de interés por año, número de veces que el interés se capitalice por año, número de años, cantidad después de t años: \$112.65 **5.** 2.000, 7.103, 77.880, 1.587 **7.** 0.885, 0.606, 0.117, 1.837

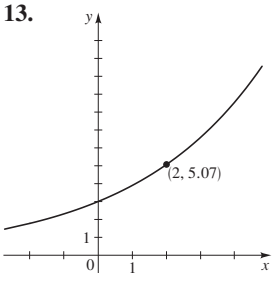
9.



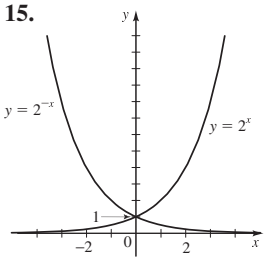
11.



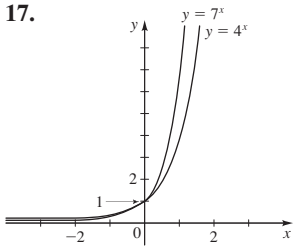
13.



15.

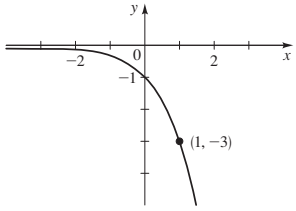


17.

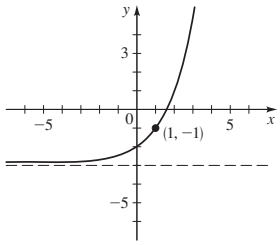


19. $f(x) = 3^x$ **21.** $f(x) = \left(\frac{1}{4}\right)^x$ **23.** II

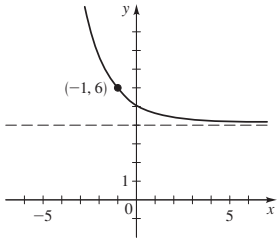
25. $\mathbb{R}$, $(-\infty, 0)$, $y = 0$



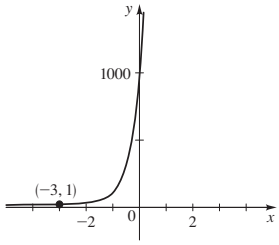
27. $\mathbb{R}$, $(-3, \infty)$, $y = -3$



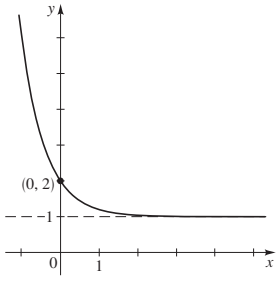
29. $\mathbb{R}$, $(4, \infty)$, $y = 4$



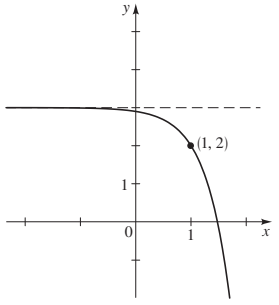
31. $\mathbb{R}$, $(0, \infty)$, $y = 0$



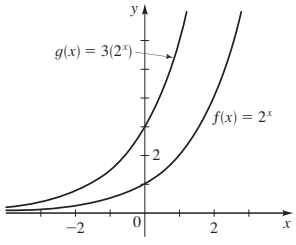
33. $\mathbb{R}$, $(1, \infty)$, $y = 1$



35. $\mathbb{R}$, $(-\infty, 3)$, $y = 3$

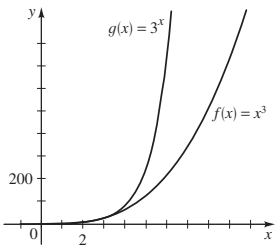


37. (a)



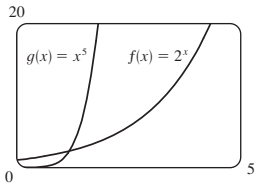
(b) La gráfica de g es más pronunciada que la de f.

39.

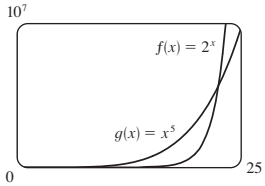


41. (a)

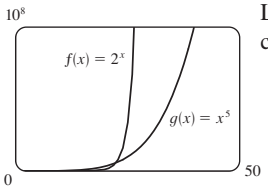
(i)



(ii)



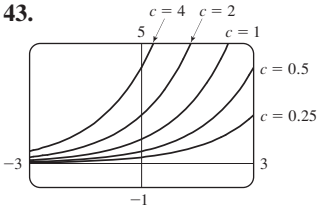
(iii)



La gráfica de f por último aumenta con mucha mayor rapidez que la de g.

(b) 1.2, 22.4

43.



Cuanto mayor sea el valor de c, con más rapidez crece la gráfica.

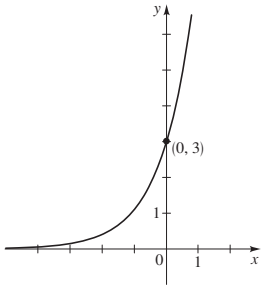
45. (a) Creciente sobre $(-\infty, 0.50]$; decreciente sobre $[0.50, \infty)$ **(b)** $(0, 1.78]$ **47. (a)** $1500 \cdot 2^t$ **(b)** 25,165,824,000
49. \$5203.71, \$5415.71, \$5636.36, \$5865.99, \$6104.98, \$6353.71
51. (a) \$11,605.41 **(b)** \$13,468.55 **(c)** \$15,630.80
53. (a) \$519.02 **(b)** \$538.75 **(c)** \$726.23 **55.** \$7678.96
57. 8.30%

SECCIÓN 4.2 ■ PÁGINA 312

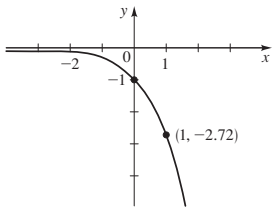
1. natural; 2.71828 **2.** principal, tasa de interés por año, número de años; cantidad después de t años; \$112.75
3. 20.085, 1.259, 2.718, 0.135

5.

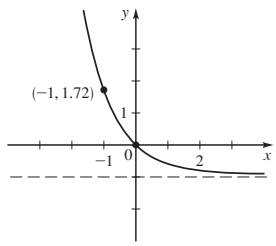
x	y
−2	0.41
−1	1.10
−0.5	1.82
0	3
0.5	4.95
1	8.15
2	22.17



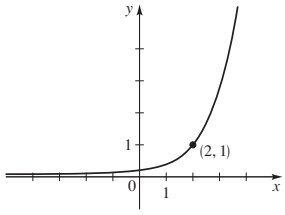
7. $\mathbb{R}$, $(-\infty, 0)$, $y = 0$



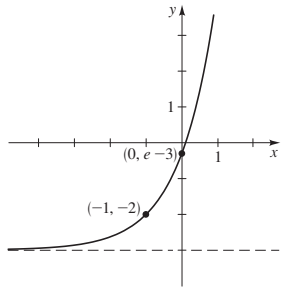
9. $\mathbb{R}$, $(-1, \infty)$, $y = -1$



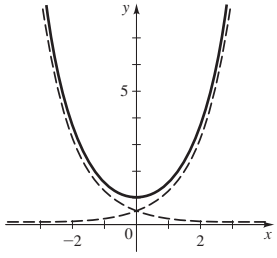
11. $\mathbb{R}$, $(0, \infty)$, $y = 0$



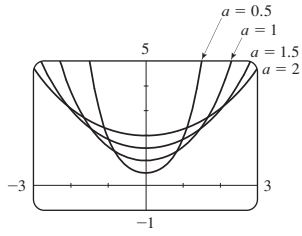
13. $\mathbb{R}$, $(-3, \infty)$, $y = -3$



15. (a)

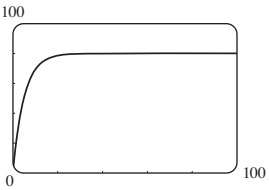


17. (a)



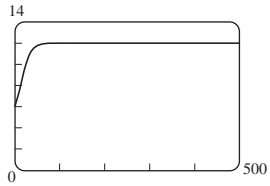
(b) Cuanto mayor sea el valor de a, más ancha es la gráfica.

19. Mínimo local $\approx (0.27, 1.75)$
21. (a) 13 kg **(b)** 6.6 kg
23. (a) 0 **(b)** 50.6 pies/s, 69.2 pies/s
(c)



(d) 80 pies/s

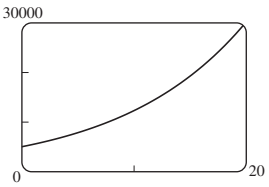
25. (a) 100 **(b)** 482, 999, 1168 **(c)** 1200
27. (a) 11.79 mil millones, 11.97 mil millones
(b)



(c) 12 mil millones

29. \$7213.18, \$7432.86, \$7659.22, \$7892.48, \$8132.84, \$8380.52
31. (a) \$2145.02 **(b)** \$2300.55 **(c)** \$3043.92 **33. (a)** \$768.05
(b) \$769.22 **(c)** \$769.82 **(d)** \$770.42 **35.** (a) es el mejor.

37. **(a)** $A(t) = 5000e^{0.09t}$ **(b)**



(c) Después de 17.88 años

SECCIÓN 4.3 ■ PÁGINA 322

1. 10^x

x	10^3	10^2	10^1	10^0	10^{-1}	10^{-2}	10^{-3}	$10^{1/2}$
log x	3	2	1	0	-1	-2	-3	$\frac{1}{2}$

2. 9; 1, 0, -1, 2, $\frac{1}{2}$

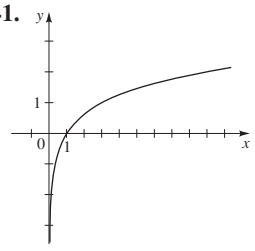
3. **(a)** $\log_5 125 = 3$ **(b)** $5^2 = 25$ **4.** **(a)** III **(b)** II **(c)** I **(d)** IV

5.

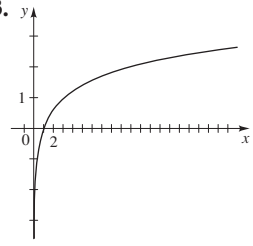
Forma logarítmica	Forma exponencial
$\log_8 8 = 1$	$8^1 = 8$
$\log_8 64 = 2$	$8^2 = 64$
$\log_8 4 = \frac{2}{3}$	$8^{2/3} = 4$
$\log_8 512 = 3$	$8^3 = 512$
$\log_8 \frac{1}{8} = -1$	$8^{-1} = \frac{1}{8}$
$\log_8 \frac{1}{64} = -2$	$8^{-2} = \frac{1}{64}$

7. **(a)** $5^2 = 25$ **(b)** $5^0 = 1$ **9.** **(a)** $8^{1/3} = 2$ **(b)** $2^{-3} = \frac{1}{8}$
11. **(a)** $e^x = 5$ **(b)** $e^5 = y$ **13.** **(a)** $\log_5 125 = 3$
(b) $\log_{10} 0.0001 = -4$ **15.** **(a)** $\log_8 \frac{1}{8} = -1$ **(b)** $\log_2 \frac{1}{8} = -3$
17. **(a)** $\ln 2 = x$ **(b)** $\ln y = 3$ **19.** **(a)** 1 **(b)** 0 **(c)** 2
21. **(a)** 2 **(b)** 2 **(c)** 10 **23.** **(a)** -3 **(b)** $\frac{1}{2}$ **(c)** -1
25. **(a)** 37 **(b)** 8 **(c)** $\sqrt{5}$ **27.** **(a)** $-\frac{2}{3}$ **(b)** 4 **(c)** -1
29. **(a)** 32 **(b)** 4 **31.** **(a)** 5 **(b)** 27 **33.** **(a)** 100 **(b)** 25
35. **(a)** 2 **(b)** 4 **37.** **(a)** 0.3010 **(b)** 1.5465 **(c)** -0.1761
39. **(a)** 1.6094 **(b)** 3.2308 **(c)** 1.0051

41.

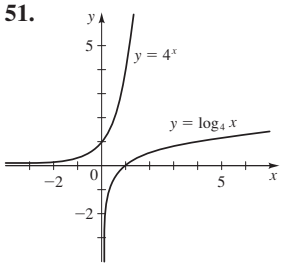


43.

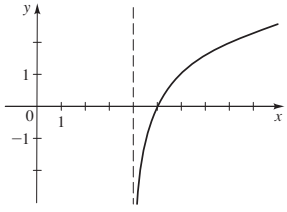


45. $y = \log_5 x$ **47.** $y = \log_9 x$ **49.** I

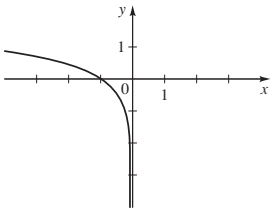
51.



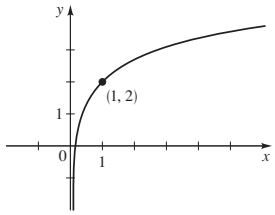
53. $(4, \infty), \mathbb{R}, x = 4$



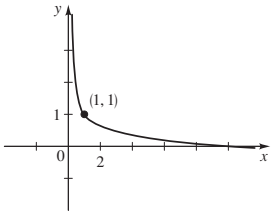
55. $(-\infty, 0), \mathbb{R}, x = 0$



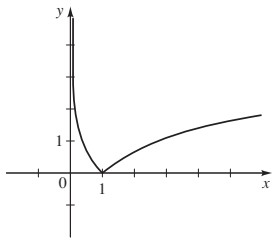
57. $(0, \infty), \mathbb{R}, x = 0$



59. $(0, \infty), \mathbb{R}, x = 0$

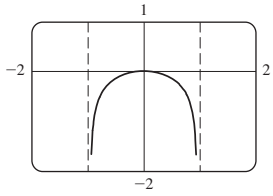


61. $(0, \infty), [0, \infty), x = 0$



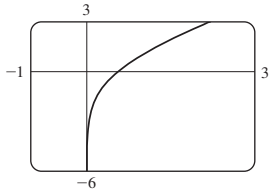
63. $(-3, \infty)$ **65.** $(-\infty, -1) \cup (1, \infty)$ **67.** $(0, 2)$

69.



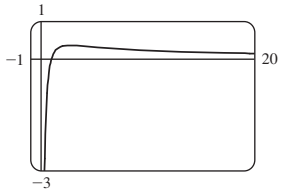
dominio $(-1, 1)$
asíntotas verticales $x = 1$, $x = -1$
máximo local $(0, 0)$

71.



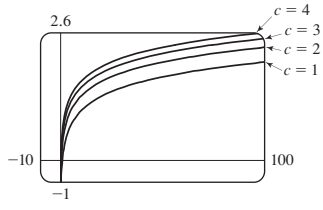
dominio $(0, \infty)$
asíntota vertical $x = 0$
no hay máximo ni mínimo

73.



dominio $(0, \infty)$
asíntota vertical $x = 0$
asíntota horizontal $y = 0$
máximo local
$\approx (2.72, 0.37)$

75. $(f \circ g)(x) = 2^{x+1}, (-\infty, \infty); (g \circ f)(x) = 2^x + 1, (-\infty, \infty)$
77. $(f \circ g)(x) = \log_2 (x - 2), (2, \infty)$;
$(g \circ f)(x) = \log_2 x - 2, (0, \infty)$
79. La gráfica de f crece con más lentitud que g.
81. **(a)**



(b) La gráfica de $f(x) = \log(cx)$ es la gráfica de $f(x) = \log(x)$ desplazada hacia arriba $\log c$ unidades.

83. **(a)** $(1, \infty)$ **(b)** $f^{-1}(x) = 10^{2^x}$

85. **(a)** $f^{-1}(x) = \log_2\left(\dfrac{x}{1-x}\right)$ **(b)** $(0, 1)$ **87.** 2602 años

89. 11.5 años, 9.9 años, 8.7 años **91.** 5.32, 4.32

SECCIÓN 4.4 ■ PÁGINA 329

1. suma; $\log_5 25 + \log_5 125 = 2 + 3$
2. diferencia; $\log_5 25 - \log_5 125 = 2 - 3$
3. por el; $10 \cdot \log_5 25$
4. **(a)** $2\log x + \log y - \log z$

(b) $\log\left(\dfrac{x^2y}{z}\right)$

5. 10, e; Cambio de Base; $\log_7 12 = \dfrac{\log 12}{\log 7} = 1.277$

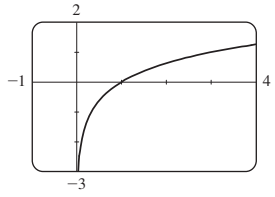
6. Verdadero **7.** $\frac{3}{2}$ **9.** 2 **11.** 3 **13.** 3 **15.** 200 **17.** 4
19. $1 + \log_2 x$ **21.** $\log_2 x + \log_2(x-1)$
23. $10 \log 6$ **25.** $\log_2 A + 2\log_2 B$ **27.** $\log_3 x + \frac{1}{2}\log_3 y$
29. $\frac{1}{3}\log_5(x^2+1)$ **31.** $\frac{1}{2}(\ln a + \ln b)$
33. $3\log x + 4\log y - 6\log z$
35. $\log_2 x + \log_2(x^2+1) - \frac{1}{2}\log_2(x^2-1)$
37. $\ln x + \frac{1}{2}(\ln y - \ln z)$ **39.** $\frac{1}{4}\log(x^2+y^2)$
41. $\frac{1}{2}[\log(x^2+4) - \log(x^2+1) - 2\log(x^3-7)]$
43. $3\ln x + \frac{1}{2}\ln(x-1) - \ln(3x+4)$ **45.** $\log_3 160$

47. $\log_2(AB/C^2)$ **49.** $\log\left(\dfrac{x^4(x-1)^2}{\sqrt[3]{x^2+1}}\right)$

51. $\ln(5x^2(x^2+5)^3)$

53. $\log\left(\dfrac{x^2}{x-3}\right)$ **55.** 2.321928 **57.** 2.523719

59. 0.493008 **61.** 3.482892
63.



69. **(a)** $P = c/W^k$ **(b)** 1866, 64
71. **(a)** $M = -2.5\log B + 2.5\log B_0$

SECCIÓN 4.5 ■ PÁGINA 338

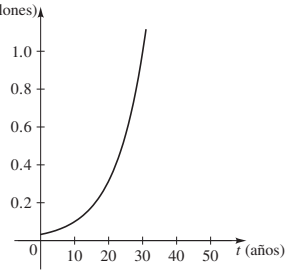
1. **(a)** $e^x = 25$ **(b)** $x = \ln 25$ **(c)** 3.219
2. **(a)** $\log 3(x-2) = \log x$ **(b)** $3(x-2) = x$ **(c)** 3
3. 1.3979 **5.** −0.9730 **7.** −0.5850 **9.** 1.2040 **11.** 0.0767
13. 0.2524 **15.** 1.9349 **17.** −43.0677 **19.** 2.1492
21. 6.2126 **23.** −2.9469 **25.** −2.4423 **27.** 14.0055
29. $\ln 2 \approx 0.6931, 0$ **31.** $\frac{1}{2}\ln 3 \approx 0.5493$ **33.** ± 1 **35.** $0, \frac{4}{3}$
37. $e^{10} \approx 22026$ **39.** 0.01 **41.** $\frac{95}{3}$ **43.** −7 **45.** 5 **47.** 5
49. $\frac{13}{12}$ **51.** 4 **53.** 6 **55.** $\frac{3}{2}$ **57.** $1/\sqrt{5} \approx 0.4472$ **59.** 2.21
61. 0.00, 1.14 **63.** −0.57 **65.** 0.36
67. $2 < x < 4$ o $7 < x < 9$ **69.** $\log 2 < x < \log 5$

71. $f^{-1}(x) = \dfrac{\ln x}{2\ln 2}$ **73.** $f^{-1}(x) = 2^x + 1$

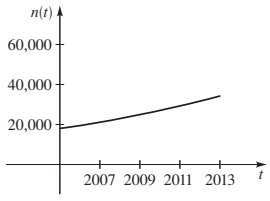
75. **(a)** \$6435.09 **(b)** 8.24 años **77.** 6.33 años **79.** 8.15 años
81. 13 días **83.** **(a)** 7337 **(b)** 1.73 años **85.** **(a)** $P = P_0 e^{-h/k}$
(b) 56.47 kPa **87.** **(a)** $t = -\frac{5}{13}\ln(1 - \frac{13}{60}I)$ **(b)** 0.218 s

SECCIÓN 4.6 ■ PÁGINA 350

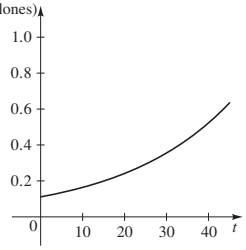
1. **(a)** $n(t) = 10 \cdot 2^{2t/3}$ **(b)** 1.05×10^8 **(c)** Después de 14.9 h
3. **(a)** 3125 **(b)** 317,480
(c)



5. **(a)** $n(t) = 18{,}000e^{0.08t}$ **(b)** 34,137
(c)



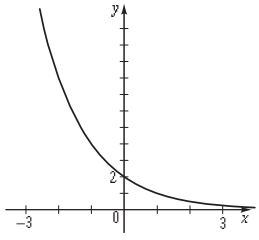
7. **(a)** 233 millones **(b)** 181 millones
9. **(a)** $n(t) = 112{,}000 \cdot 2^{t/18}$ **(b)** $n(t) = 112{,}000e^{0.0385t}$
(c)



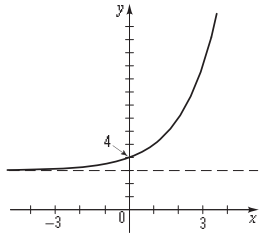
(d) En el año 2045
11. **(a)** 20,000 **(b)** $n(t) = 20{,}000e^{0.1096t}$ **(c)** Sobre 48,000
(d) 2017 **13.** **(a)** $n(t) = 8600e^{0.1508t}$ **(b)** Sobre 11,600
(c) 4.6 h **15.** **(a)** $n(t) = 29.76e^{0.012936t}$ millones
(b) 53.5 años **(c)** 38.55 millones **17.** **(a)** $m(t) = 22 \cdot 2^{-t/1600}$
(b) $m(t) = 22e^{-0.000433t}$ **(c)** 3.9 mg **(d)** 463.4 años
19. 18 años **21.** 149 h **23.** 3560 años
25. **(a)** 210°F **(b)** 153°F **(c)** 28 min
27. **(a)** 137°F **(b)** 116 min
29. **(a)** 2.3 **(b)** 3.5 **(c)** 8.3
31. **(a)** 10^{-3} M **(b)** 3.2×10^{-7} M
33. $4.8 \le \text{pH} \le 6.4$ **35.** $\log 20 \approx 1.3$ **37.** El doble de intenso
39. 8.2 **41.** 73 dB **43.** **(b)** 106 dB

REPASO DEL CAPÍTULO 4 ■ PÁGINA 353

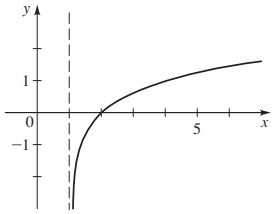
1. 0.089, 9.739, 55.902 **3.** 11.954, 2.989, 2.518
5. $\mathbb{R}$, $(0, \infty)$, $y = 0$



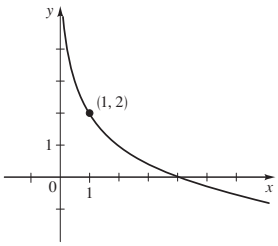
7. $\mathbb{R}$, $(3, \infty)$, $y = 3$



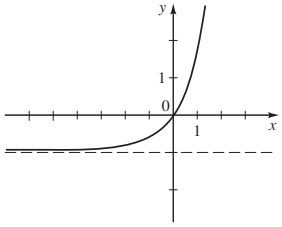
9. $(1, \infty)$, $\mathbb{R}$, $x = 1$



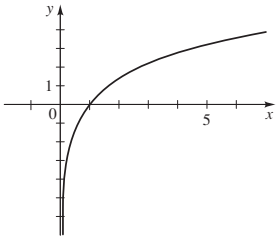
11. $(0, \infty)$, $\mathbb{R}$, $x = 0$



13. $\mathbb{R}$, $(-1, \infty)$, $y = -1$



15. $(0, \infty)$, $\mathbb{R}$, $x = 0$

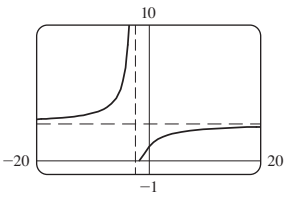


17. $\left(-\infty, \frac{1}{2}\right)$ **19.** $(-\infty, -2) \cup (2, \infty)$ **21.** $2^{10} = 1024$
23. $10^y = x$ **25.** $\log_2 64 = 6$ **27.** $\log 74 = x$ **29.** 7 **31.** 45
33. 6 **35.** -3 **37.** $\frac{1}{2}$ **39.** 2 **41.** 92 **43.** $\frac{2}{3}$
45. $\log A + 2 \log B + 3 \log C$ **47.** $\frac{1}{2}[\ln(x^2 - 1) - \ln(x^2 + 1)]$
49. $2 \log_5 x + \frac{3}{2} \log_5(1 - 5x) - \frac{1}{2} \log_5(x^3 - x)$

51. $\log 96$ **53.** $\log_2\left(\dfrac{(x - y)^{3/2}}{(x^2 + y^2)^2}\right)$ **55.** $\log\left(\dfrac{x^2 - 4}{\sqrt{x^2 + 4}}\right)$

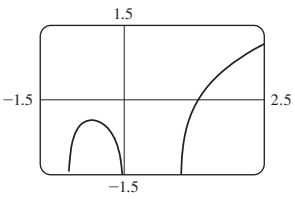
57. 5 **59.** 2.60 **61.** -1.15 **63.** $-4, 2$
65. -15 **67.** 3 **69.** 0.430618
71. 2.303600

73.



asíntota vertical
$x = -2$
asíntota horizontal
$y = 2.72$
no hay máximo ni mínimo

75.

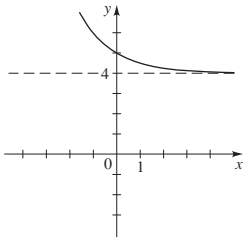


asíntotas verticales
$x = -1, x = 0, x = 1$
máximo local
$\approx (-0.58, -0.41)$

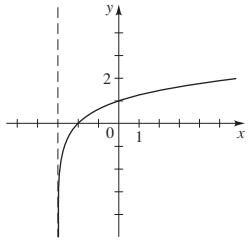
77. 2.42 **79.** $0.16 < x < 3.15$
81. Creciente sobre $(-\infty, 0]$ y $[1.10, \infty)$, decreciente sobre $[0, 1.10]$
83. 1.953445 **85.** -0.579352 **87.** $\log_4 258$
89. **(a)** \$16,081.15 **(b)** \$16,178.18 **(c)** \$16,197.64
(d) \$16,198.31 **91.** 1.83 años **93.** 4.341%
95. **(a)** $n(t) = 30e^{0.15t}$ **(b)** 55 **(c)** 19 años
97. **(a)** 9.97 mg **(b)** 1.39×10^5 años
99. **(a)** $n(t) = 150e^{-0.0004359t}$ **(b)** 97.0 mg **(c)** 2520 años
101. **(a)** $n(t) = 1500e^{0.1515t}$ **(b)** 7940
103. 7.9, básico **105.** 8.0

EXAMEN DE CAPÍTULO 4 ■ PÁGINA 356

1. **(a)** $\mathbb{R}$, $(4, \infty)$, $y = 4$



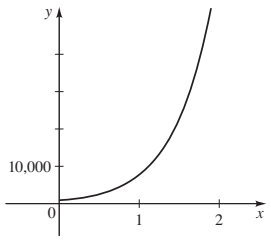
(b) $(-3, \infty)$, $\mathbb{R}$, $x = -3$



2. **(a)** $\log_6 25 = 2x$ **(b)** $e^3 = A$
3. **(a)** 36 **(b)** 3 **(c)** $\frac{3}{2}$ **(d)** 3 **(e)** $\frac{2}{3}$ **(f)** 2
4. $\frac{1}{3}[\log(x + 2) - 4 \log x - \log(x^2 + 4)]$

5. $\ln\left(\dfrac{x\sqrt{3 - x^4}}{(x^2 + 1)^2}\right)$ **6.** **(a)** 4.32 **(b)** 0.77 **(c)** 5.39 **(d)** 2

7. **(a)** $n(t) = 1000e^{2.07944t}$
(b) 22,627 **(c)** 1.3 h
(d)

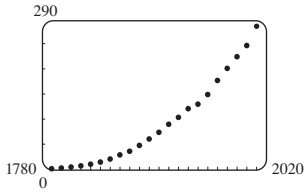


8. **(a)** $A(t) = 12{,}000\left(1 + \dfrac{0.056}{12}\right)^{12t}$

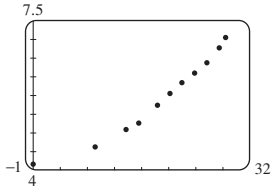
(b) \$14,195.06 **(c)** 9.249 años
9. **(a)** $A(t) = 3e^{-0.069t}$ **(b)** 0.048 g **(c)** después de 3.6 minutos
10. 1995 veces más intenso

ENFOQUE SOBRE MODELADO ■ PÁGINA 363

1. **(a)**

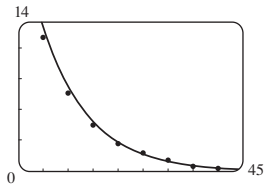


(b) $y = ab^t$, donde $a = 1.180609 \times 10^{-15}$, $b = 1.0204139$, y y es la población en millones en el año t **(c)** 515.9 millones
(d) 207.8 millones **(e)** No
3. **(a)** Sí **(b)** Sí, la gráfica de dispersión parece lineal.



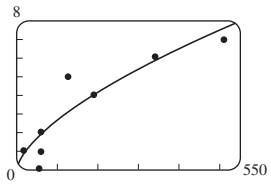
(c) $\ln E = 4.551436 + 0.092383t$, donde t es años desde 1970 y E es el gasto en miles de millones de dólares
(d) $E = 94.76838139e^{at}$, donde $a = 0.0923827621$
(e) 3478.5 mil millones de dólares

5. **(a)** $I_0 = 22.7586444$, $k = 0.1062398$

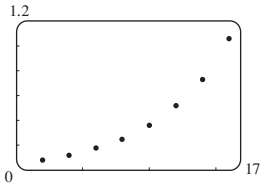
(b) 

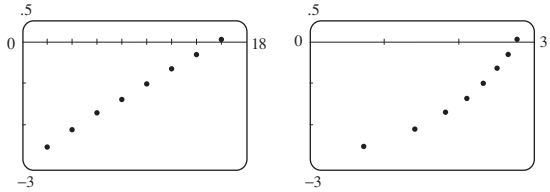
(c) 47.3 pies

7. **(a)** $S = 0.14A^{0.64}$

(b) 

(c) 4 especies

9. **(a)** 

(b) 

(c) Función exponencial

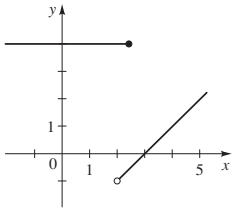
(d) $y = ab^x$ donde $a = 0.057697$ y $b = 1.200236$

11. **(a)** $y = \dfrac{c}{1 + ae^{-bx}}$, donde $a = 49.10976596$,

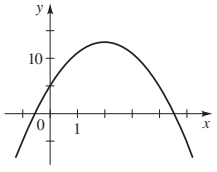
$b = 0.4981144989$, y $c = 500.855793$ **(b)** 10.58 días

EXAMEN ACUMULATIVO DEL REPASO PARA LOS CAPÍTULOS 2,3 Y 4 ■ PÁGINA 367

1. **(a)** $(-\infty, \infty)$ **(b)** $[-4, \infty)$ **(c)** 12, 0, 0, 2, $2\sqrt{3}$, no definido
(d) $x^2 - 4$, $\sqrt{x+6}$, $-4 + h^2$ **(e)** $\frac{1}{8}$
(f) $f \circ g = x + 4 - \sqrt{x+4}$, $g \circ f = |x - 2|$, $f(g(12)) = 0$, $g(f(12)) = 10$ **(g)** $g^{-1}(x) = x^2 - 4$, $x \geq 0$

2. **(a)** 4, 4, 4, 0, 1 **(b)** 

3. **(a)** $f(x) = -2(x - 2)^2 + 13$ **(b)** Máximo 13

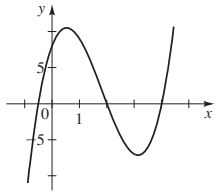
(c) 

(d) Creciente sobre $(-\infty, 2]$; decreciente sobre $[2, \infty)$

(e) Se desplaza hacia arriba 5 unidades

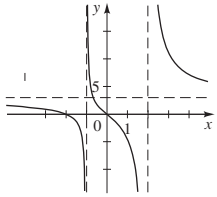
(f) Se desplaza a la izquierda 3 unidades

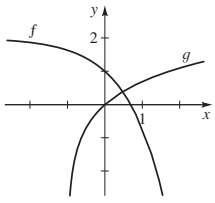
4. f, D; g, C; r, A; s, F; h, B; k, E

5. **(a)** $\pm 1, \pm 2, \pm 4, \pm 8, \pm\frac{1}{2}$ **(b)** 2, 4, $-\frac{1}{2}$
(c) $P(x) = 2(x - 2)(x - 4)\left(x + \frac{1}{2}\right)$ **(d)** 

6. **(a)** 1 (multiplicidad 2); -1, $1 + i$, $1 - i$ (multiplicidad 1)
(b) $Q(x) = (x - 1)^2(x + 1)(x - 1 - i)(x - 1 + i)$
(c) $Q(x) = (x - 1)^2(x + 1)(x^2 - 2x + 2)$

7. puntos de intersección x 0, -2; punto de intersección y 0; asíntota horizontal $y = 3$; asíntotas verticales $x = 2$ y $x = -1$



8. 

9. **(a)** -4 **(b)** $5 \log x + \frac{1}{2}\log(x - 1) - \log(2x - 3)$
10. **(a)** 4 **(b)** ln 2, ln 4 **11.** **(a)** \$29,396.15
(b) Después de 6.23 años **(c)** 12.837 años
12. **(a)** $P(t) = 120e^{0.0565t}$ **(b)** 917 **(c)** Después de 49.8 meses

CAPÍTULO 5

SECCIÓN 5.1 ■ PÁGINA 375

1. **(a)** $(0, 0)$, 1 **(b)** $x^2 + y^2 = 1$ **(c)** (i) 0 (ii) 0 (iii) 0 (iv) 0 **2.** **(a)** terminal **(b)** $(0, 1)$, $(-1, 0)$, $(0, -1)$, $(1, 0)$
9. $-\frac{4}{5}$ **11.** $-2\sqrt{2}/3$ **13.** $3\sqrt{5}/7$ **15.** $P\left(\frac{4}{5}, \frac{3}{5}\right)$
17. $P\left(-\sqrt{5}/3, \frac{2}{3}\right)$ **19.** $P\left(-\sqrt{2}/3, -\sqrt{7}/3\right)$
21. $t = \pi/4$, $\left(\sqrt{2}/2, \sqrt{2}/2\right)$; $t = \pi/2$, $(0, 1)$;
$t = 3\pi/4$, $\left(-\sqrt{2}/2, \sqrt{2}/2\right)$; $t = \pi$, $(-1, 0)$;
$t = 5\pi/4$, $\left(-\sqrt{2}/2, -\sqrt{2}/2\right)$; $t = 3\pi/2$, $(0, -1)$;
$t = 7\pi/4$, $\left(\sqrt{2}/2, -\sqrt{2}/2\right)$; $t = 2\pi$, $(1, 0)$
23. $(0, 1)$ **25.** $\left(-\sqrt{3}/2, \frac{1}{2}\right)$ **27.** $\left(\frac{1}{2}, -\sqrt{3}/2\right)$
29. $\left(-\frac{1}{2}, \sqrt{3}/2\right)$ **31.** $\left(-\sqrt{2}/2, -\sqrt{2}/2\right)$
33. **(a)** $\left(-\frac{3}{5}, \frac{4}{5}\right)$ **(b)** $\left(\frac{3}{5}, -\frac{4}{5}\right)$ **(c)** $\left(-\frac{3}{5}, -\frac{4}{5}\right)$ **(d)** $\left(\frac{3}{5}, \frac{4}{5}\right)$
35. **(a)** $\pi/4$ **(b)** $\pi/3$ **(c)** $\pi/3$ **(d)** $\pi/6$
37. **(a)** $2\pi/7$ **(b)** $2\pi/9$ **(c)** $\pi - 3 \approx 0.14$ **(d)** $2\pi - 5 \approx 1.28$
39. **(a)** $\pi/3$ **(b)** $\left(-\frac{1}{2}, \sqrt{3}/2\right)$
41. **(a)** $\pi/4$ **(b)** $\left(-\sqrt{2}/2, \sqrt{2}/2\right)$
43. **(a)** $\pi/3$ **(b)** $\left(-\frac{1}{2}, -\sqrt{3}/2\right)$
45. **(a)** $\pi/4$ **(b)** $\left(-\sqrt{2}/2, -\sqrt{2}/2\right)$
47. **(a)** $\pi/6$ **(b)** $\left(-\sqrt{3}/2, -\frac{1}{2}\right)$
49. **(a)** $\pi/3$ **(b)** $\left(\frac{1}{2}, \sqrt{3}/2\right)$ **51.** **(a)** $\pi/3$ **(b)** $\left(-\frac{1}{2}, -\sqrt{3}/2\right)$
53. $(0.5, 0.8)$ **55.** $(0.5, -0.9)$

SECCIÓN 5.2 ■ PÁGINA 384

1. $y, x, y/x$ **2.** 1, 1 **3.** $t = \pi/4$, $\operatorname{sen} t = \sqrt{2}/2$, $\cos t = \sqrt{2}/2$; $t = \pi/2$, $\operatorname{sen} t = 1$, $\cos t = 0$; $t = 3\pi/4$, $\operatorname{sen} t = \sqrt{2}/2$, $\cos t = -\sqrt{2}/2$; $t = \pi$, $\operatorname{sen} t = 0$, $\cos t = -1$; $t = 5\pi/4$, $\operatorname{sen} t = -\sqrt{2}/2$, $\cos t = -\sqrt{2}/2$; $t = 3\pi/2$, $\operatorname{sen} t = -1$, $\cos t = 0$; $t = 7\pi/4$, $\operatorname{sen} t = -\sqrt{2}/2$, $\cos t = \sqrt{2}/2$; $t = 2\pi$, $\operatorname{sen} t = 0$, $\cos t = 1$

5. **(a)** $\sqrt{3}/2$ **(b)** $-1/2$ **(c)** $-\sqrt{3}$

7. **(a)** $-1/2$ **(b)** $-1/2$ **(c)** $-1/2$

9. **(a)** $-\sqrt{2}/2$ **(b)** $-\sqrt{2}/2$ **(c)** $\sqrt{2}/2$

11. **(a)** $\sqrt{3}/2$ **(b)** $2\sqrt{3}/3$ **(c)** $\sqrt{3}/3$

13. **(a)** -1 **(b)** 0 **(c)** 0

15. **(a)** 2 **(b)** $-2\sqrt{3}/3$ **(c)** 2

17. **(a)** $-\sqrt{3}/3$ **(b)** $\sqrt{3}/3$ **(c)** $-\sqrt{3}/3$

19. **(a)** $\sqrt{2}/2$ **(b)** $-\sqrt{2}$ **(c)** -1

21. **(a)** -1 **(b)** 1 **(c)** -1 **23.** **(a)** 0 **(b)** 1 **(c)** 0

25. $\operatorname{sen} 0 = 0$, $\cos 0 = 1$, $\tan 0 = 0$, $\sec 0 = 1$, otras no definidas

27. $\operatorname{sen} \pi = 0$, $\cos \pi = -1$, $\tan \pi = 0$, $\sec \pi = -1$, otras no definidas

29. $\frac{4}{5}, \frac{3}{5}, \frac{4}{3}$ **31.** $-\sqrt{11}/4$, $\sqrt{5}/4$, $-\sqrt{55}/5$

33. $\sqrt{13}/7$, $-6/7$, $-\sqrt{13}/6$ **35.** $-\frac{12}{13}, -\frac{5}{13}, \frac{12}{5}$ **37.** $\frac{21}{29}, -\frac{20}{29}, -\frac{21}{20}$

39. **(a)** 0.8 **(b)** 0.84147 **41.** **(a)** 0.9 **(b)** 0.93204

43. **(a)** 1 **(b)** 1.02964 **45.** **(a)** -0.6 **(b)** -0.57482

47. Negativo **49.** Negativo **51.** II **53.** II

55. $\operatorname{sen} t = \sqrt{1 - \cos^2 t}$

57. $\tan t = (\operatorname{sen} t)/\sqrt{1 - \operatorname{sen}^2 t}$

59. $\sec t = -\sqrt{1 + \tan^2 t}$

61. $\tan t = \sqrt{\sec^2 t - 1}$

63. $\tan^2 t = (\operatorname{sen}^2 t)/(1 - \operatorname{sen}^2 t)$

65. $\cos t = -\frac{4}{5}$, $\tan t = -\frac{3}{4}$, $\csc t = \frac{5}{3}$, $\sec t = -\frac{5}{4}$, $\cot t = -\frac{4}{3}$

67. $\operatorname{sen} t = -2\sqrt{2}/3$, $\cos t = \frac{1}{3}$, $\tan t = -2\sqrt{2}$, $\csc t = -\frac{3}{4}\sqrt{2}$, $\cot t = -\sqrt{2}/4$

69. $\operatorname{sen} t = -\frac{3}{5}$, $\cos t = \frac{4}{5}$, $\csc t = -\frac{5}{3}$, $\sec t = \frac{5}{4}$, $\cot t = -\frac{4}{3}$

71. $\cos t = -\sqrt{15}/4$, $\tan t = \sqrt{15}/15$, $\csc t = -4$, $\sec t = -4\sqrt{15}/15$, $\cot t = \sqrt{15}$

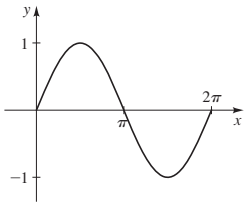
73. Impar **75.** Impar **77.** Par **79.** Ninguna de éstas

81. $y(0) = 4$, $y(0.25) = -2.828$, $y(0.50) = 0$, $y(0.75) = 2.828$, $y(1.00) = -4$, $y(1.25) = 2.828$

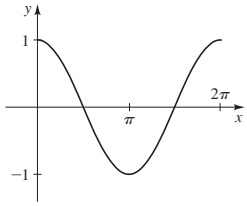
83. **(a)** 0.49870 amp **(b)** -0.17117 amp

SECCIÓN 5.3 ■ PÁGINA 396

1. 1, 2π



2. 3, π



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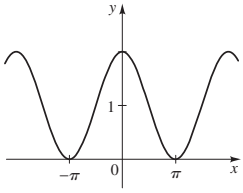

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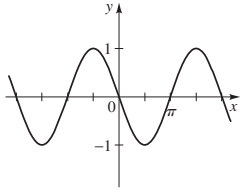

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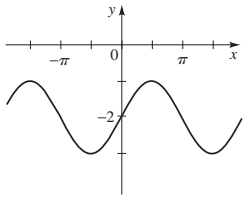

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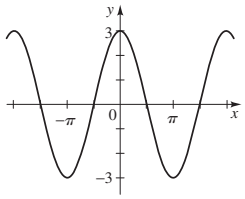

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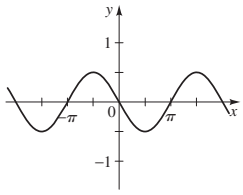

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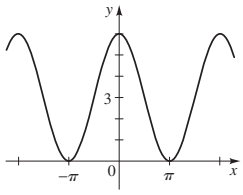
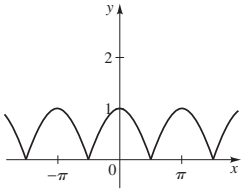
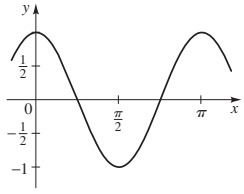


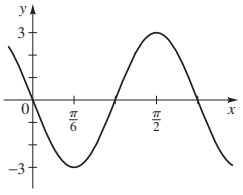
15.



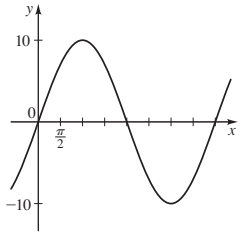
17. 1, π



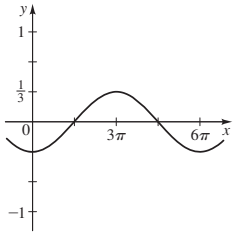
19. 3, $2\pi/3$



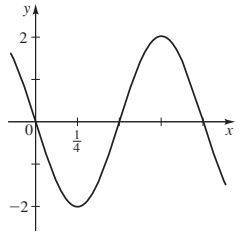
21. 10, 4π



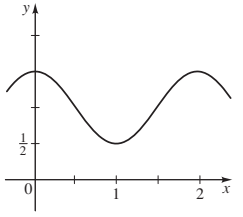
23. $\frac{1}{3}$, 6π



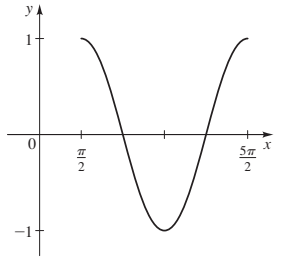
25. 2, 1



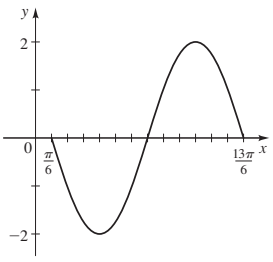
27. $\frac{1}{2}$, 2



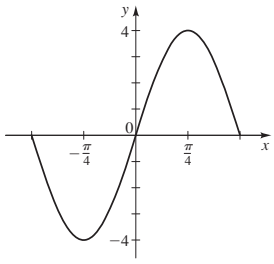
29. 1, 2π, $\pi/2$



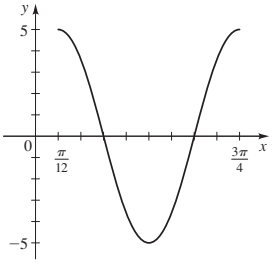
31. 2, 2π, $\pi/6$



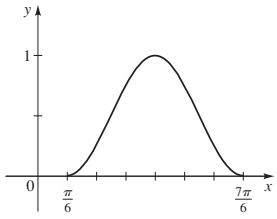
33. 4, π, $-\pi/2$



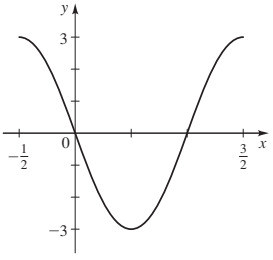
35. 5, $2\pi/3$, $\pi/12$



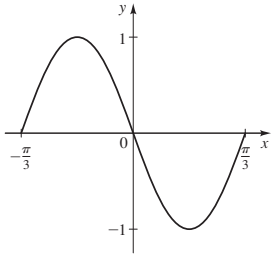
37. $\frac{1}{2}$, π, $\pi/6$



39. 3, 2, $-\frac{1}{2}$



41. 1, $2\pi/3$, $-\pi/3$



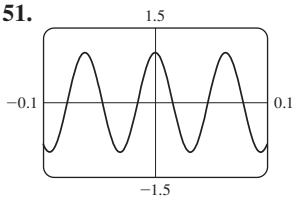
43. **(a)** 4, 2π, 0 **(b)** $y = 4 \operatorname{sen} x$

45. **(a)** $\frac{3}{2}$, $\frac{2\pi}{3}$, 0 **(b)** $y = \frac{3}{2}\cos 3x$

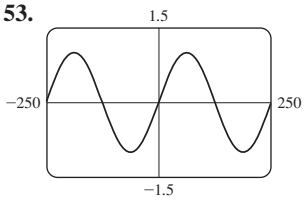
47. **(a)** $\frac{1}{2}$, π, $-\frac{\pi}{3}$ **(b)** $y = -\frac{1}{2}\cos 2\left(x + \pi/3\right)$

49. **(a)** 4, $\frac{3}{2}$, $-\frac{1}{2}$ **(b)** $y = 4 \operatorname{sen} \frac{4\pi}{3}\left(x + \frac{1}{2}\right)$

51.



53.



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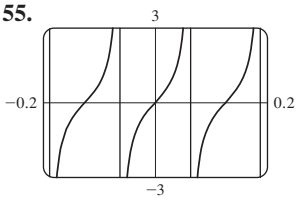
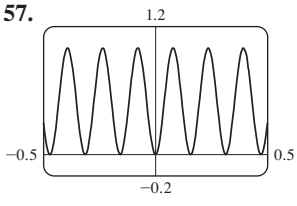


57.



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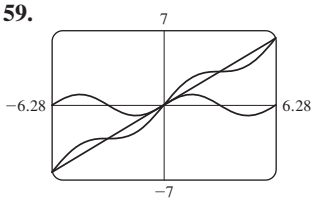
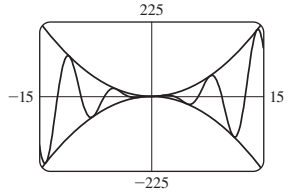
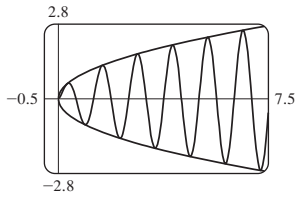


61.



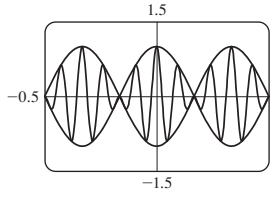
$y = x^2 \operatorname{sen} x$ es una curva senoidal que está entre las gráficas de $y = x^2$ y $y = -x^2$

63.



$y = \sqrt{x} \operatorname{sen} 5\pi x$ es una curva senoidal que está entre las gráficas de $y = \sqrt{x}$ y $y = -\sqrt{x}$

65.



$y = \cos 3\pi x \cos 21\pi x$ es una curva senoidal que está entre las gráficas de $y = \cos 3\pi x$ y $y = -\cos 3\pi x$

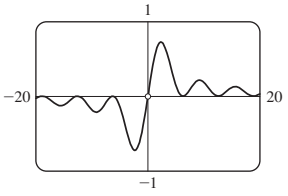
67. Valor máximo 1.76 cuando $x \approx 0.94$, valor mínimo -1.76 cuando $x \approx -0.94$ (Los mismos valores máximo y mínimo se presentan en un número infinito de otros valores de x.)

69. Valor máximo 3.0 cuando $x \approx 1.57$, valor mínimo -1.00 cuando $x \approx -1.57$ (Los mismos valores máximo y mínimo se presentan en un número infinito de otros valores de x.)

71. 1.16 **73.** 0.34, 2.80

75. **(a)** Impar **(b)** 0, $\pm 2\pi$, $\pm 4\pi$, $\pm 6\pi$, . . .

(c)



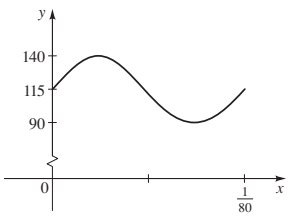
(d) $f(x)$ se aproxima a 0

(e) $f(x)$ se aproxima a 0

77. **(a)** 20 s **(b)** 6 pies

79. **(a)** $\frac{1}{80}$ min **(b)** 80

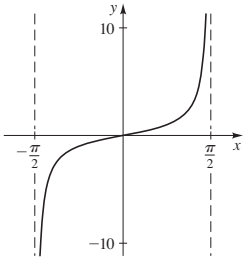
(c)



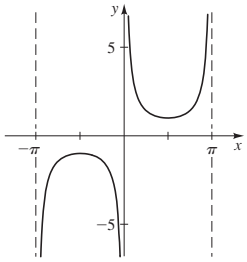
(d) $\frac{140}{90}$; es más alto de lo normal

SECCIÓN 5.4 ■ PÁGINA 405

1. π; $\frac{\pi}{2} + n\pi$, n un entero

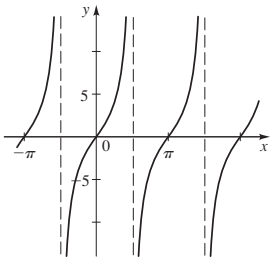


2. 2π; $n\pi$, n un entero

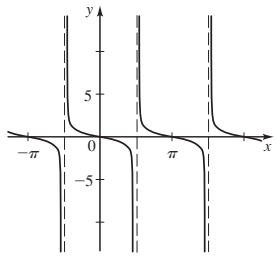


3. II **5.** VI **7.** IV

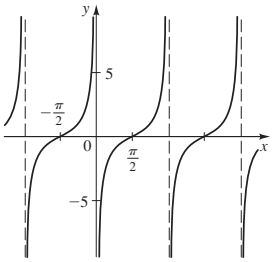
9. π



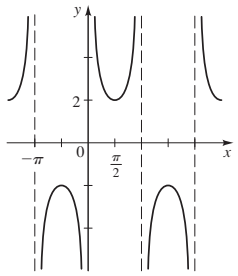
11. π



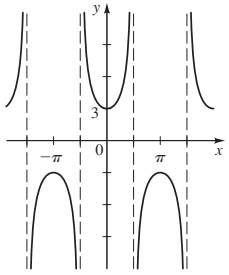
13. π



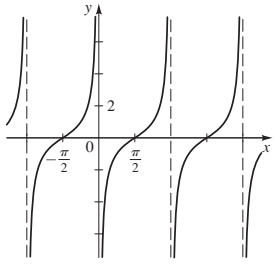
15. 2π



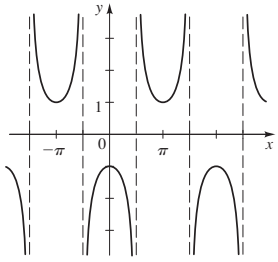
17. 2π



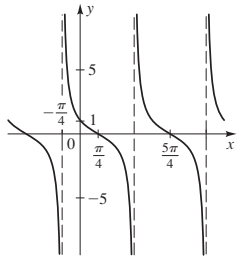
19. π



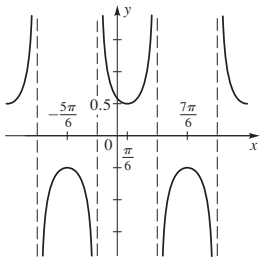
21. 2π



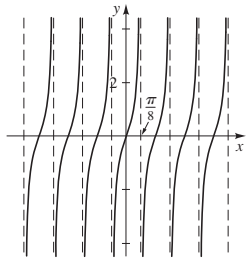
23. π



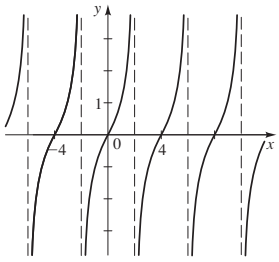
25. 2π



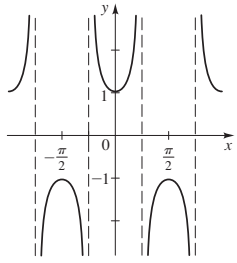
27. $\pi/4$



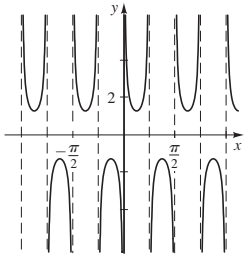
29. 4



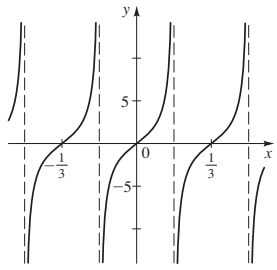
31. π



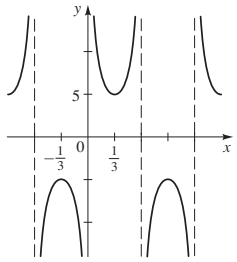
33. $\pi/2$



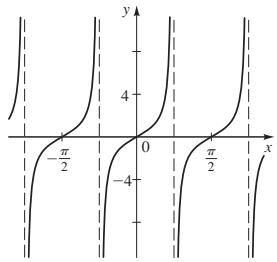
35. $\frac{1}{3}$



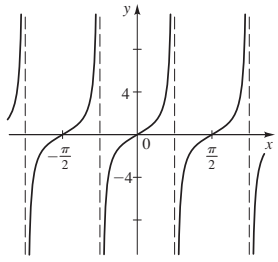
37. $\frac{4}{3}$



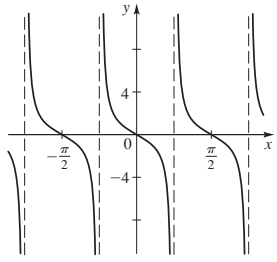
39. $\pi/2$



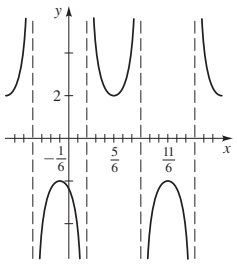
41. $\pi/2$



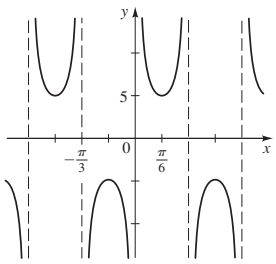
43. $\pi/2$



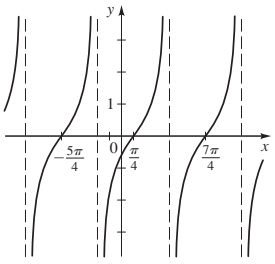
45. 2



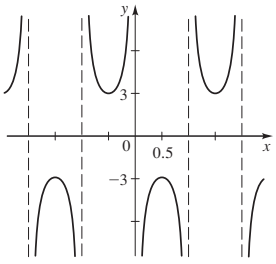
47. $2\pi/3$



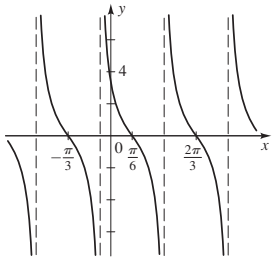
49. $3\pi/2$



51. 2

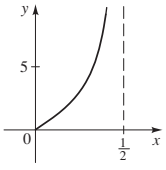


53. $\pi/2$



57. **(a)** 1.53 mi, 3.00 mi, 18.94 mi

(b)



(c) $d(t)$ se aproxima al ∞

SECCIÓN 5.5 ■ PÁGINA 411

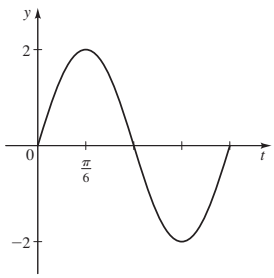
1. **(a)** $[-\pi/2, \pi/2]$, y, x, $\pi/6$, $\pi/6$, $\frac{1}{2}$
(b) $[0, \pi]$; y, x, $\pi/3$, $\pi/3$, $\frac{1}{2}$ **2.** $[-1, 1]$; (b)
3. **(a)** $\pi/2$ **(b)** $\pi/3$ **(c)** No está definida
5. **(a)** π **(b)** $\pi/3$ **(c)** $5\pi/6$
7. **(a)** $-\pi/4$ **(b)** $\pi/3$ **(c)** $\pi/6$
9. **(a)** $2\pi/3$ **(b)** $-\pi/4$ **(c)** $\pi/4$ **11.** 0.72973
13. 2.01371 **15.** 2.75876 **17.** 1.47113 **19.** 0.88998
21. −0.26005 **23.** $\frac{1}{4}$ **25.** 5
27. No está definida **29.** $5\pi/6$ **31.** $-\pi/6$ **33.** $\pi/6$ **35.** $\pi/6$
37. $-\pi/3$ **39.** $\sqrt{3}/3$ **41.** $\frac{1}{2}$ **43.** $-\sqrt{2}/2$

SECCIÓN 5.6 ■ PÁGINA 420

1. **(a)** a sen ωt **(b)** a cos ωt
2. **(a)** ke^{-ct} sen ωt **(b)** ke^{-ct} cos ωt

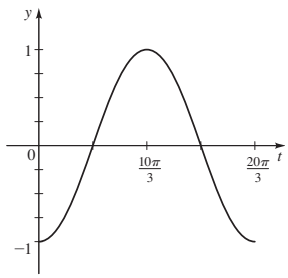
3. **(a)** 2, $2\pi/3$, $3/(2\pi)$

(b)



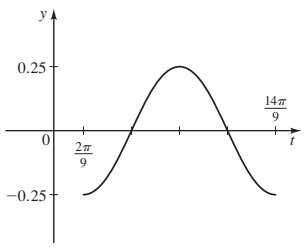
5. **(a)** 1, $20\pi/3$, $3/(20\pi)$

(b)



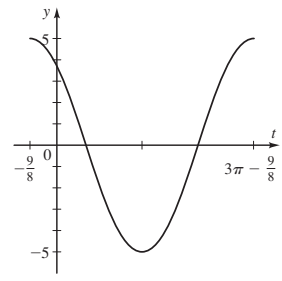
7. **(a)** $\frac{1}{4}$, $4\pi/3$, $3/(4\pi)$

(b)



9. **(a)** 5, 3π, $1/(3\pi)$

(b)

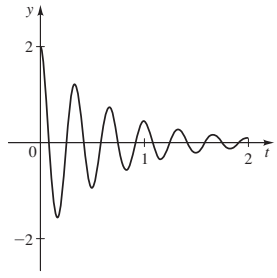


11. $y = 10 \operatorname{sen}\left(\dfrac{2\pi}{3}t\right)$ **13.** $y = 6 \operatorname{sen}(10t)$

15. $y = 60 \cos(4\pi t)$ **17.** $y = 2.4 \cos(1500\pi t)$

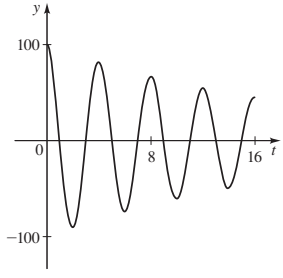
19. **(a)** $y = 2e^{-1.5t} \cos 6\pi t$

(b)

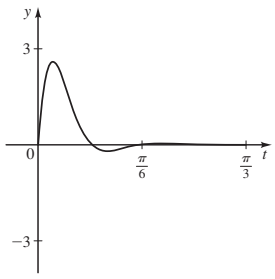


21. **(a)** $y = 100e^{-0.05t} \cos \dfrac{\pi}{2}t$

(b)

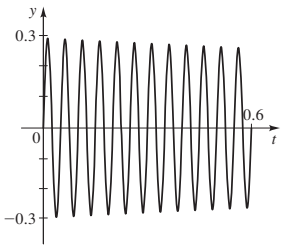


23. **(a)** $y = 7e^{-10t}\operatorname{sen} 12t$ **(b)**



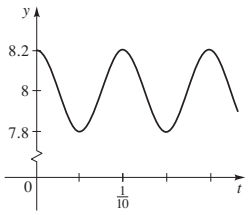
25. **(a)** $y = 0.3e^{-0.2t}\operatorname{sen}(40\pi t)$

(b)



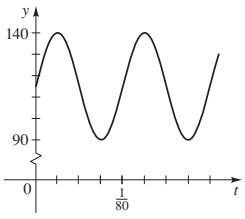
27. **(a)** 10 ciclos por minuto

(b)



(c) 0.4 m

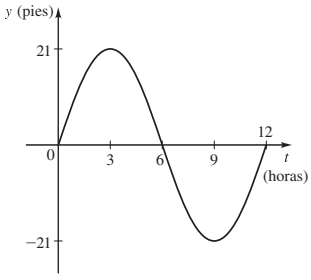
29. **(a)** 25, 0.0125, 80 **(b)**



(c) El período disminuye y la frecuencia aumenta.

31. $d(t) = 5\operatorname{sen}(5\pi t)$

33. $y = 21\operatorname{sen}\left(\dfrac{\pi}{6}t\right)$



35. $y = 5\cos(2\pi t)$ **37.** $y = 11 + 10\operatorname{sen}\left(\dfrac{\pi t}{10}\right)$

39. $y = 3.8 + 0.2\operatorname{sen}\left(\dfrac{\pi}{5}t\right)$

41. $f(t) = 10\operatorname{sen}\left(\dfrac{\pi}{12}(t-8)\right) + 90$

43. **(a)** 45 V **(b)** 40 **(c)** 40 **(d)** $E(t) = 45\cos(80\pi t)$

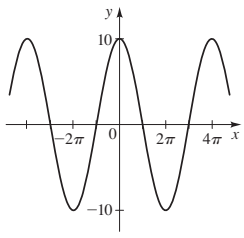
45. $f(t) = e^{-0.9t}\operatorname{sen}\pi t$ **47.** $e = \dfrac{1}{3}\ln 4 \approx 0.46$

REPASO DEL CAPÍTULO 5 ■ PÁGINA 424

1. **(b)** $\frac{1}{2}, -\sqrt{3}/2, -\sqrt{3}/3$ **3.** **(a)** $\pi/3$ **(b)** $\left(-\frac{1}{2}, \sqrt{3}/2\right)$
(c) $\operatorname{sen} t = \sqrt{3}/2, \cos t = -\frac{1}{2}, \tan t = -\sqrt{3}, \csc t = 2\sqrt{3}/3,$
$\sec t = -2, \cot t = -\sqrt{3}/3$
5. **(a)** $\pi/4$ **(b)** $(-\sqrt{2}/2, -\sqrt{2}/2)$
(c) $\operatorname{sen} t = -\sqrt{2}/2, \cos t = -\sqrt{2}/2,$
$\tan t = 1, \csc t = -\sqrt{2}, \sec t = -\sqrt{2}, \cot t = 1$
7. **(a)** $\sqrt{2}/2$ **(b)** $-\sqrt{2}/2$ **9.** **(a)** 0.89121 **(b)** 0.45360
11. **(a)** 0 **(b)** No definido **13.** **(a)** No definido **(b)** 0
15. **(a)** $-\sqrt{3}/3$ **(b)** $-\sqrt{3}$ **17.** $(\operatorname{sen} t)/(1 - \operatorname{sen}^2 t)$
19. $(\operatorname{sen} t)/\sqrt{1 - \operatorname{sen}^2 t}$
21. $\tan t = -\frac{5}{12}, \csc t = \frac{13}{5}, \sec t = -\frac{13}{12}, \cot t = -\frac{12}{5}$
23. $\operatorname{sen} t = 2\sqrt{5}/5, \cos t = -\sqrt{5}/5,$
$\tan t = -2, \sec t = -\sqrt{5}$
25. $(16 - \sqrt{17})/4$ **27.** 3

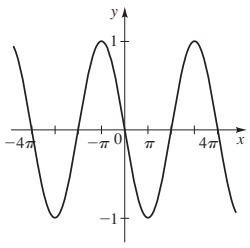
29. **(a)** $10, 4\pi, 0$

(b)



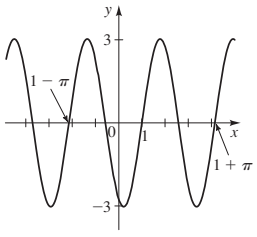
31. **(a)** $1, 4\pi, 0$

(b)



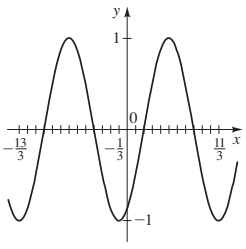
33. **(a)** $3, \pi, 1$

(b)



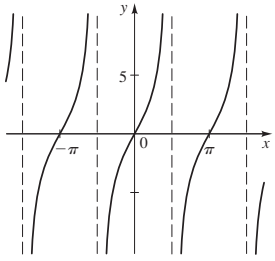
35. **(a)** $1, 4, -\frac{1}{3}$

(b)



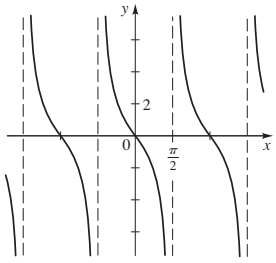
37. $y = 5\operatorname{sen} 4x$

41. π

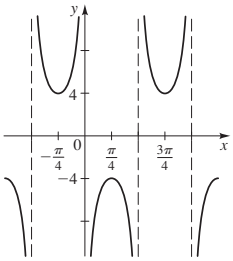


39. $y = \frac{1}{2}\operatorname{sen} 2\pi\left(x + \frac{1}{3}\right)$

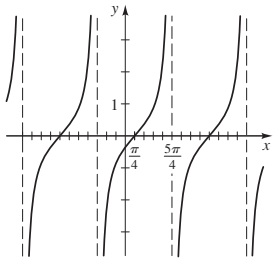
43. π



45. π

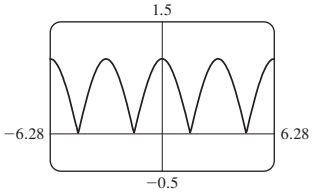


47. 2π



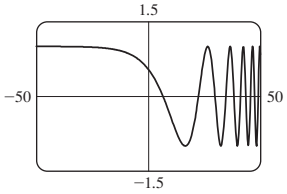
49. $\frac{\pi}{2}$ **51.** $\frac{\pi}{6}$

53. (a)



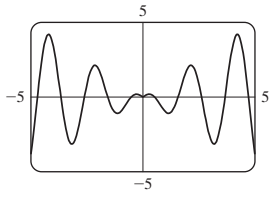
(b) Período π
(c) Par

55. (a)



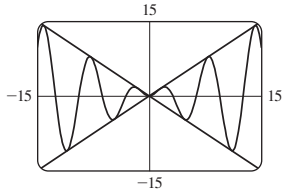
(b) No periódica
(c) Ninguna

57. (a)



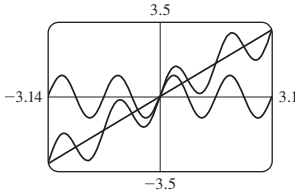
(b) No periódica
(c) Par

59.



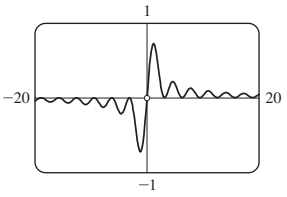
$y = x \operatorname{sen} x$ es una función senoidal cuya gráfica está entre las de $y = x$ y $y = -x$

61.



Las gráficas están relacionadas por adición gráfica.

63. 1.76, −1.76 **65.** 0.30, 2.84
67. (a) Impar **(b)** $0, \pm\pi, \pm 2\pi, \ldots$
(c)

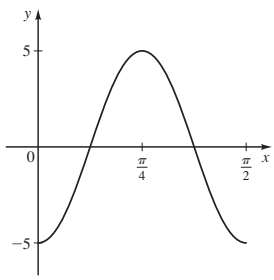


(d) $f(x)$ se aproxima a 0
(e) $f(x)$ se aproxima a 0
69. $y = 50 \cos(16\pi t)$
71. $y = 4 \cos(\frac{\pi}{6} t)$

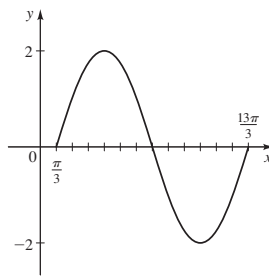
EXAMEN DEL CAPÍTULO 5 ■ PÁGINA 426

1. $y = -\frac{5}{6}$ **2. (a)** $\frac{4}{5}$ **(b)** $-\frac{3}{5}$ **(c)** $-\frac{4}{3}$ **(d)** $-\frac{5}{3}$
3. (a) $-\frac{1}{2}$ **(b)** $-\sqrt{2}/2$ **(c)** $\sqrt{3}$ **(d)** -1
4. $\tan t = -(\operatorname{sen} t)/\sqrt{1 - \operatorname{sen}^2 t}$ **5.** $-\frac{2}{15}$

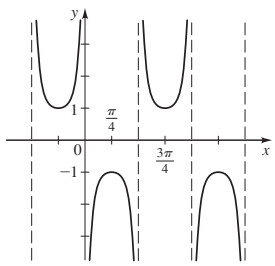
6. (a) $5, \pi/2, 0$
(b)



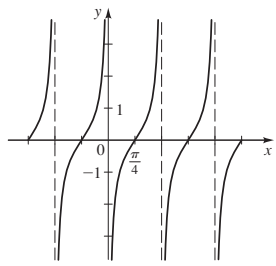
7. (a) $2, 4\pi, \pi/3$
(b)



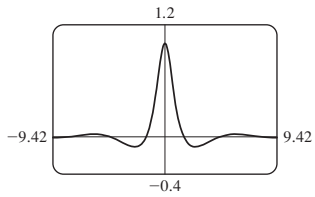
8. π



9. $\pi/2$

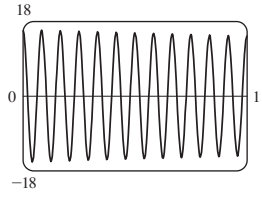


10. (a) $\pi/4$ **(b)** $5\pi/6$ **(c)** 0 **(d)** $1/2$
11. $y = 2 \operatorname{sen} 2(x + \pi/3)$
12. (a)



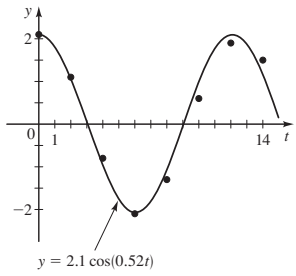
(b) Par
(c) Valor mínimo -0.11 cuando $x \approx \pm 2.54$, valor máximo 1 cuando $x = 0$

13. $y = 5 \operatorname{sen}(4\pi t)$
14. $y = 16e^{-0.1t} \cos 24\pi t$



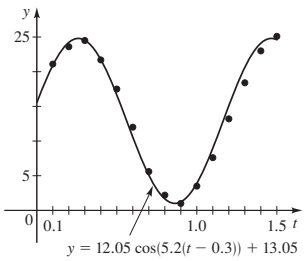
ENFOQUE SOBRE MODELADO ■ PÁGINA 430

1. (a) y **(c)**



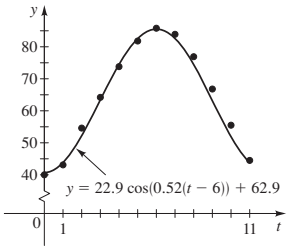
(b) $y = 2.1 \cos(0.52t)$
(d) $y = 2.05 \operatorname{sen}(0.50t + 1.55) - 0.01$ **(e)** La fórmula de (d) se reduce a $y = 2.05 \cos(0.50t - 0.02) - 0.01$. Igual que (b), redondeada a un decimal.

3. **(a)** y **(c)**



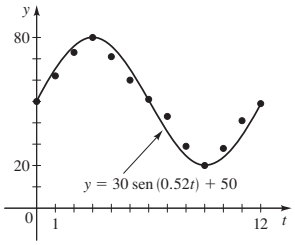
(b) $y = 12.05\cos(5.2(t - 0.3)) + 13.05$
(d) $y = 11.72\,\text{sen}(5.05t + 0.24) + 12.96$ **(e)** La fórmula de (d) se reduce a $y = 11.72\cos(5.05(t - 0.26)) + 12.96$. Cercana, pero no idéntica, a (b).

5. **(a)** y **(c)**



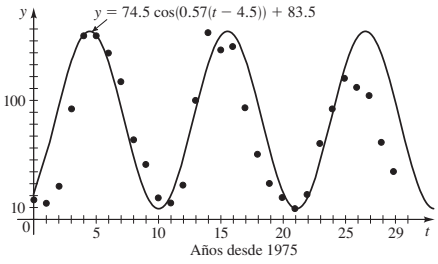
(b) $y = 22.9\cos(0.52(t - 6)) + 62.9$, donde y es la temperatura (°F) y t es meses (enero $= 0$)
(d) $y = 23.4\,\text{sen}\,(0.48t - 1.36) + 62.2$

7. **(a)** y **(c)**



(b) $y = 30\,\text{sen}(0.52t) + 50$ donde y es la población de lechuzas en el año t **(d)** $y = 25.8\,\text{sen}(0.52t - 0.02) + 50.6$

9. **(a)** y **(c)**



(b) $y = 74.5\cos(0.57(t - 4.5)) + 83.5$, donde y es la cantidad promedio de manchas solares diarias, y t es los años desde 1975
(d) $y = 67.65\,\text{sen}(0.62t - 1.65) + 74.5$

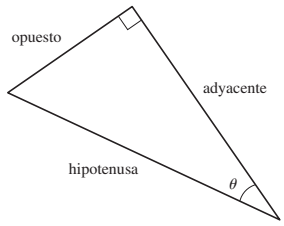
Capítulo 6

SECCIÓN 6.1 ■ PÁGINA 440

1. **(a)** arc, 1 **(b)** $\pi/180$ **(c)** $180/\pi$ **2.** **(a)** $r\theta$ **(b)** $\frac{1}{2}r^2\theta$
3. $2\pi/5 \approx 1.257$ rad **5.** $-\pi/4 \approx -0.785$ rad
7. $-5\pi/12 \approx -1.309$ rad **9.** $6\pi \approx 18.850$ rad
11. $8\pi/15 \approx 1.676$ rad **13.** $\pi/24 \approx 0.131$ rad **15.** 210°
17. −225° **19.** $540/\pi \approx 171.9°$ **21.** $-216/\pi \approx -68.8°$
23. 18° **25.** −24° **27.** 410°, 770°, −310°, −670°
29. $11\pi/4$, $19\pi/4$, $-5\pi/4$, $-13\pi/4$
31. $7\pi/4$, $15\pi/4$, $-9\pi/4$, $-17\pi/4$ **33.** Sí **35.** Sí **37.** Sí
39. 13° **41.** 30° **43.** 280° **45.** $5\pi/6$ **47.** π **49.** $\pi/4$
51. $55\pi/9 \approx 19.2$ **53.** 4 **55.** 4 mi **57.** 2 rad ≈ 114.6°
59. $36/\pi \approx 11.459$ m **61.** **(a)** 35.45 **(b)** 25 **63.** 50 m^2
65. 4 m **67.** 6 cm^2 **69.** 13.9 mi **71.** 330π mi ≈ 1037 mi
73. 1.6 millones de millas **75.** 1.15 mi
77. 360π pulg.^{2} ≈ 1130.97 pulg.^{2} **79.** **(a)** 90π rad/min
(b) 1440π pulg./min ≈ 4523.9 pulg./min
81. $32\pi/15$ pies/s ≈ 6.7 pies/s **83.** 1039.6 mi/h **85.** 2.1 m/s
87. **(a)** 10π cm ≈ 31.4 cm **(b)** 5 cm **(c)** 3.32 cm **(d)** 86.8 cm^3

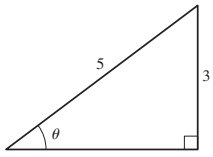
SECCIÓN 6.2 ■ PÁGINA 448

1. **(a)**

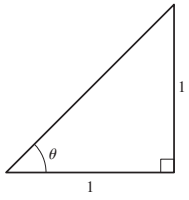


(b) $\dfrac{\text{opuesto}}{\text{hipotenusa}}, \dfrac{\text{adyacente}}{\text{hipotenusa}}, \dfrac{\text{opuesto}}{\text{adyacente}}$ **(c)** semejante

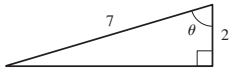
2. $\text{sen}\,\theta$, $\cos\theta$, $\tan\theta$
3. $\text{sen}\,\theta = \frac{4}{5}$, $\cos\theta = \frac{3}{5}$, $\tan\theta = \frac{4}{3}$, $\csc\theta = \frac{5}{4}$, $\sec\theta = \frac{5}{3}$, $\cot\theta = \frac{3}{4}$
5. $\text{sen}\,\theta = \frac{40}{41}$, $\cos\theta = \frac{9}{41}$, $\tan\theta = \frac{40}{9}$, $\csc\theta = \frac{41}{40}$, $\sec\theta = \frac{41}{9}$, $\cot\theta = \frac{9}{40}$
7. $\text{sen}\,\theta = 2\sqrt{13}/13$, $\cos\theta = 3\sqrt{13}/13$, $\tan\theta = \frac{2}{3}$, $\csc\theta = \sqrt{13}/2$, $\sec\theta = \sqrt{13}/3$, $\cot\theta = \frac{3}{2}$
9. **(a)** $3\sqrt{34}/34$, $3\sqrt{34}/34$ **(b)** $\frac{3}{5}, \frac{3}{5}$ **(c)** $\sqrt{34}/5$, $\sqrt{34}/5$
11. $\frac{25}{2}$ **13.** $13\sqrt{3}/2$ **15.** 16.51658
17. $x = 28\cos\theta$, $y = 28\,\text{sen}\,\theta$
19. $\cos\theta = \frac{4}{5}$, $\tan\theta = \frac{3}{4}$, $\csc\theta = \frac{5}{3}$, $\sec\theta = \frac{5}{4}$, $\cot\theta = \frac{4}{3}$



21. $\text{sen}\,\theta = \sqrt{2}/2$, $\cos\theta = \sqrt{2}/2$, $\tan\theta = 1$, $\csc\theta = \sqrt{2}$, $\sec\theta = \sqrt{2}$

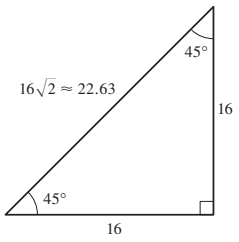


23. $\text{sen}\,\theta = 3\sqrt{5}/7$, $\cos\theta = \frac{2}{7}$, $\tan\theta = 3\sqrt{5}/2$, $\csc\theta = 7\sqrt{5}/15$, $\cot\theta = 2\sqrt{5}/15$

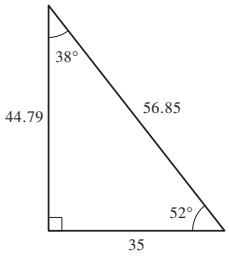


25. $(1 + \sqrt{3})/2$ **27.** 1 **29.** $\frac{1}{2}$

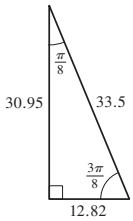
31.



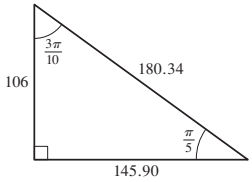
33.



35.



37.



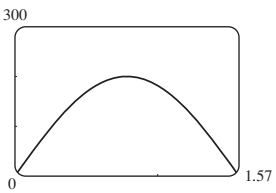
39. sen $\theta \approx 0.45$, cos $\theta \approx 0.89$, tan $\theta = 0.50$, csc $\theta \approx 2.24$, sec $\theta \approx 1.12$, cot $\theta = 2.00$ **41.** 230.9 **43.** 63.7
45. $x = 10 \tan\theta \operatorname{sen}\theta$ **47.** 1026 pies **49.** **(a)** 2100 mi **(b)** No
51. 19 pies **53.** 345 pies **55.** 415 pies, 152 pies **57.** 2570 pies
59. 5808 pies **61.** 91.7 millones de millas **63.** 3960 mi
65. 0.723 AU

SECCIÓN 6.3 ■ PÁGINA 459

1. y/r, x/r, y/x **2.** cuadrante, positivo, negativo, negativo
3. **(a)** 30° **(b)** 30° **(c)** 30° **5.** **(a)** 45° **(b)** 90° **(c)** 75°
7. **(a)** $\pi/4$ **(b)** $\pi/6$ **(c)** $\pi/3$ **9.** **(a)** $2\pi/7$ **(b)** 0.4π **(c)** 1.4
11. $\frac{1}{2}$ **13.** $-\sqrt{3}/2$ **15.** $-\sqrt{3}$ **17.** 1 **19.** $-\sqrt{3}/2$
21. $\sqrt{3}/3$ **23.** $\sqrt{3}/2$ **25.** -1 **27.** $\frac{1}{2}$ **29.** 2 **31.** -1
33. No definido **35.** III **37.** IV
39. $\tan\theta = -\sqrt{1 - \cos^2\theta}/\cos\theta$
41. $\cos\theta = \sqrt{1 - \operatorname{sen}^2\theta}$
43. $\sec\theta = -\sqrt{1 + \tan^2\theta}$
45. $\cos\theta = -\frac{4}{5}$, $\tan\theta = -\frac{3}{4}$, $\csc\theta = \frac{5}{3}$, $\sec\theta = -\frac{5}{4}$, $\cot\theta = -\frac{4}{3}$
47. $\operatorname{sen}\theta = -\frac{3}{5}$, $\cos\theta = \frac{4}{5}$, $\csc\theta = -\frac{5}{3}$, $\sec\theta = \frac{5}{4}$, $\cot\theta = -\frac{4}{3}$
49. $\operatorname{sen}\theta = \frac{1}{2}$, $\cos\theta = \sqrt{3}/2$, $\tan\theta = \sqrt{3}/3$, $\sec\theta = 2\sqrt{3}/3$, $\cot\theta = \sqrt{3}$
51. $\operatorname{sen}\theta = 3\sqrt{5}/7$, $\tan\theta = -3\sqrt{5}/2$, $\csc\theta = 7\sqrt{5}/15$, $\sec\theta = -\frac{7}{2}$, $\cot\theta = -2\sqrt{5}/15$
53. **(a)** $\sqrt{3}/2$, $\sqrt{3}$ **(b)** $\frac{1}{2}$, $\sqrt{3}/4$ **(c)** $\frac{3}{4}$, 0.88967 **55.** 19.1
57. 66.1° **59.** $(4\pi/3) - \sqrt{3} \approx 2.46$
63. **(b)**

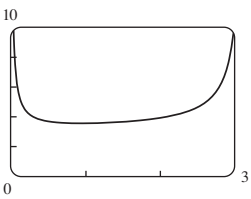
θ	20°	60°	80°	85°
h	1922	9145	29,944	60,351

65. **(a)** $A(\theta) = 400 \operatorname{sen}\theta \cos\theta$
(b)



(c) ancho = profundidad ≈ 14.14 pulg.
67. **(a)** $9\sqrt{3}/4$ pies ≈ 3.897 pies, $\frac{9}{16}$ pies $= 0.5625$ pies
(b) 23.982 pies, 3.462 pies

69. **(a)**



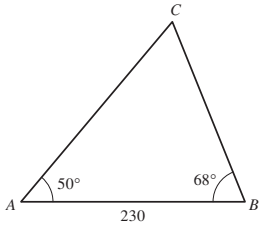
(b) 0.946 rad o 54°

SECCIÓN 6.4 ■ PÁGINA 467

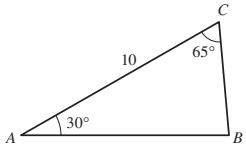
1. **(a)** $[-1, 1]$, $[-\pi/2, \pi/2]$ **(b)** $[-1, 1]$, $[0, \pi]$ **(c)** $\mathbb{R}$, $(-\pi/2, \pi/2)$ **2.** **(a)** $\frac{8}{10}$ **(b)** $\frac{6}{10}$ **(c)** $\frac{8}{6}$ **3.** **(a)** $\pi/6$ **(b)** $5\pi/6$ **(c)** $-\pi/4$ **5.** **(a)** $-\pi/6$ **(b)** $\pi/3$ **(c)** $\pi/6$
7. 0.46677 **9.** 1.82348 **11.** 1.24905 **13.** No definida
15. 36.9° **17.** 34.7° **19.** 34.9° **21.** 30°, 150°
23. 44.4°, 135.6° **25.** 45.6° **27.** $\frac{4}{5}$ **29.** $\frac{13}{5}$ **31.** $\frac{12}{5}$
33. $\sqrt{1 - x^2}$ **35.** $x/\sqrt{1 - x^2}$ **37.** 72.5°, 19 pies
39. **(a)** $h = 2 \tan\theta$ **(b)** $\theta = \tan^{-1}(h/2)$
41. **(a)** $\theta = \operatorname{sen}^{-1}(h/680)$ **(b)** $\theta = 0.826$ rad
43. **(a)** 54.1° **(b)** 48.3°, 32.2°, 24.5°. La función sen^{-1} no está definida para valores fuera del intervalo $[-1, 1]$.

SECCIÓN 6.5 ■ PÁGINA 473

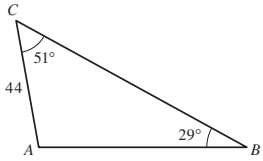
1. $\dfrac{\operatorname{sen} A}{a} = \dfrac{\operatorname{sen} B}{b} = \dfrac{\operatorname{sen} C}{c}$ **2.** ALA, LLA **3.** 318.8 **5.** 24.8
7. 44° **9.** $\angle C = 114°$, $a \approx 51$, $b \approx 24$ **11.** $\angle A = 44°$, $\angle B = 68°$, $a \approx 8.99$ **13.** $\angle C = 62°$, $a \approx 200$, $b \approx 242$



15. $\angle B = 85°$, $a \approx 5$, $c \approx 9$



17. $\angle A = 100°$, $a \approx 89$, $c \approx 71$



19. $\angle B \approx 30°$, $\angle C \approx 40°$, $c \approx 19$ **21.** No hay solución
23. $\angle A_1 \approx 125°$, $\angle C_1 \approx 30°$, $a_1 \approx 49$; $\angle A_2 \approx 5°$, $\angle C_2 \approx 150°$, $a_2 \approx 5.6$ **25.** No hay solución
27. $\angle A_1 \approx 57.2°$, $\angle B_1 \approx 93.8°$, $b_1 \approx 30.9$; $\angle A_2 \approx 122.8°$, $\angle B_2 \approx 28.2°$, $b_2 \approx 14.6$
29. **(a)** 91.146° **(b)** 14.427° **33.** **(a)** 1018 mi **(b)** 1017 mi
35. 219 pies **37.** 55.9 m **39.** 175 pies **41.** 192 m
43. 0.427 AU, 1.119 AU

SECCIÓN 6.6 ■ PÁGINA 480

1. $a^2 + b^2 - 2ab\cos C$ **2.** SSS, SAS **3.** 28.9 **5.** 47
7. 29.89° **9.** 15 **11.** $\angle A \approx 39.4°$, $\angle B \approx 20.6°$, $c \approx 24.6$

13. $\angle A \approx 48°$, $\angle B \approx 79°$, $c \approx 3.2$
15. $\angle A \approx 50°$, $\angle B \approx 73°$, $\angle C \approx 57°$
17. $\angle A_1 \approx 83.6°$, $\angle C_1 \approx 56.4°$, $a_1 \approx 193$;
$\angle A_2 \approx 16.4°$, $\angle C_2 \approx 123.6$, $a_2 \approx 54.9$ **19.** No hay tal triángulo
21. 2 **23.** 25.4 **25.** 89.2° **27.** 24.3 **29.** 54 **31.** 26.83
33. 5.33 **35.** 40.77 **37.** 3.85 cm^2 **39.** 2.30 mi **41.** 23.1 mi
43. 2179 mi **45.** **(a)** 62.6 mi **(b)** S 18.2° E **47.** 96°
49. 211 pies **51.** 3835 pies **53.** \$165,554

REPASO DEL CAPÍTULO 6 ■ PÁGINA 483

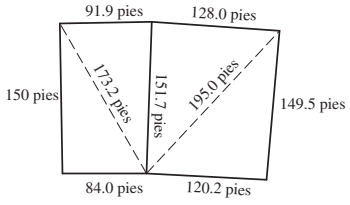
1. **(a)** $\pi/3$ **(b)** $11\pi/6$ **(c)** $-3\pi/4$ **(d)** $-\pi/2$
3. **(a)** 450° **(b)** −30° **(c)** 405° **(d)** $(558/\pi)° \approx 177.6°$
5. 8 m **7.** 82 pies **9.** 0.619 rad ≈ 35.4° **11.** 18,151 pies^2
13. 300π rad/min ≈ 942.5 rad/min,
7539.8 pulg./min = 628.3 pies/min
15. $\operatorname{sen}\theta = 5/\sqrt{74}$, $\cos\theta = 7/\sqrt{74}$, $\tan\theta = \frac{5}{7}$,
$\csc\theta = \sqrt{74}/5$, $\sec\theta = \sqrt{74}/7$, $\cot\theta = \frac{7}{5}$
17. $x \approx 3.83$, $y \approx 3.21$ **19.** $x \approx 2.92$, $y \approx 3.11$
21. $A = 70°$, $a \approx 2.819$, $b \approx 1.026$
23. $A \approx 16.3°$, $C \approx 73.7°$, $c = 24$
25. $a = \cot\theta$, $b = \csc\theta$ **27.** 48 m **29.** 1076 mi **31.** $-\sqrt{2}/2$
33. 1 **35.** $-\sqrt{3}/3$ **37.** $-\sqrt{2}/2$ **39.** $2\sqrt{3}/3$ **41.** $-\sqrt{3}$
43. $\operatorname{sen}\theta = \frac{12}{13}$, $\cos\theta = -\frac{5}{13}$, $\tan\theta = -\frac{12}{5}$,
$\csc\theta = \frac{13}{12}$, $\sec\theta = -\frac{13}{5}$, $\cot\theta = -\frac{5}{12}$ **45.** 60°
47. $\tan\theta = -\sqrt{1 - \cos^2\theta}/\cos\theta$
49. $\tan^2\theta = \operatorname{sen}^2\theta/(1 - \operatorname{sen}^2\theta)$
51. $\operatorname{sen}\theta = \sqrt{7}/4$, $\cos\theta = \frac{3}{4}$, $\csc\theta = 4\sqrt{7}/7$, $\cot\theta = 3\sqrt{7}/7$
53. $\cos\theta = -\frac{4}{5}$, $\tan\theta = -\frac{3}{4}$, $\csc\theta = \frac{5}{3}$, $\sec\theta = -\frac{5}{4}$, $\cot\theta = -\frac{4}{3}$
55. $-\sqrt{5}/5$ **57.** 1 **59.** $\pi/3$ **61.** $2/\sqrt{21}$ **63.** $x/\sqrt{1 + x^2}$
65. $\theta = \cos^{-1}(x/3)$ **67.** 5.32 **69.** 148.07 **71.** 9.17
73. 54.1° o 125.9° **75.** 80.4° **77.** 77.3 mi **79.** 3.9 mi
81. 32.12

EXAMEN DEL CAPÍTULO 6 ■ PÁGINA 487

1. $11\pi/6$, $-3\pi/4$ **2.** 240°, −74.5°
3. **(a)** 240π rad/min ≈ 753.98 rad/min
(b) 12,063.7 pies/min = 137 mi/h **4.** **(a)** $\sqrt{2}/2$
(b) $\sqrt{3}/3$ **(c)** 2 **(d)** 1 **5.** $\left(26 + 6\sqrt{13}\right)/39$
6. $a = 24\operatorname{sen}\theta$, $b = 24\cos\theta$ **7.** $(4 - 3\sqrt{2})/4$
8. $-\frac{13}{12}$ **9.** $\tan\theta = -\sqrt{\sec^2\theta - 1}$ **10.** 19.6 pies
11. **(a)** $\theta = \tan^{-1}(x/4)$ **(b)** $\theta = \cos^{-1}(3/x)$ **12.** $\frac{40}{41}$
13. 9.1 **14.** 250.5 **15.** 8.4 **16.** 19.5 **17.** 78.6° **18.** 40.2°
19. **(a)** 15.3 m^2 **(b)** 24.3 m **20.** **(a)** 129.9° **(b)** 44.9
21. 554 pies

ENFOQUE SOBRE MODELADO ■ PÁGINA 490

1. 1.41 mi **3.** 14.3 m **5.** **(c)** 2349.8 pies
7.



CAPÍTULO 7

SECCIÓN 7.1 ■ PÁGINA 498

1. todos; **2.** $\cos(-x) = \cos x$ **3.** $\operatorname{sen} t$ **5.** $\tan\theta$ **7.** −1
9. $\csc u$ **11.** $\tan\theta$ **13.** 1 **15.** $\cos y$ **17.** $\operatorname{sen}^2 x$ **19.** $\sec x$
21. $2\sec u$ **23.** $\cos^2 x$ **25.** $\cos\theta$

27. **(a)** Lado Izq $= \dfrac{1 - \operatorname{sen}^2 x}{\operatorname{sen} x} =$ Lado Der

29. Lado Izq $= \operatorname{sen}\theta\dfrac{\cos\theta}{\operatorname{sen}\theta} =$ Lado Der

31. Lado Izq $= \cos u\dfrac{1}{\cos u}\cot u =$ Lado Der

33. Lado Izq $= \operatorname{sen} B + \cos B\dfrac{\cos B}{\operatorname{sen} B}$
$= \dfrac{\operatorname{sen}^2 B + \cos^2 B}{\operatorname{sen} B} = \dfrac{1}{\operatorname{sen} B} =$ Lado Der

35. Lado Izq $= -\dfrac{\cos\alpha}{\operatorname{sen}\alpha}\cos\alpha - \operatorname{sen}\alpha = \dfrac{-\cos^2\alpha - \operatorname{sen}^2\alpha}{\operatorname{sen}\alpha}$
$= \dfrac{-1}{\operatorname{sen}\alpha} =$ Lado Der

37. Lado Izq $= \dfrac{\operatorname{sen}\theta}{\cos\theta} + \dfrac{\cos\theta}{\operatorname{sen}\theta} = \dfrac{\operatorname{sen}^2\theta + \cos^2\theta}{\cos\theta\operatorname{sen}\theta}$
$= \dfrac{1}{\cos\theta\operatorname{sen}\theta} =$ Lado Der

39. Lado Izq $= 1 - \cos^2\beta = \operatorname{sen}^2\beta =$ Lado Der

41. Lado Izq $= \dfrac{(\operatorname{sen} x + \cos x)^2}{(\operatorname{sen} x + \cos x)(\operatorname{sen} x - \cos x)} = \dfrac{\operatorname{sen} x + \cos x}{\operatorname{sen} x - \cos x}$
$= \dfrac{(\operatorname{sen} x + \cos x)(\operatorname{sen} x - \cos x)}{(\operatorname{sen} x - \cos x)(\operatorname{sen} x - \cos x)} =$ Lado Der

43. Lado Izq $= \dfrac{\frac{1}{\cos t} - \cos t}{\frac{1}{\cos t}} \cdot \dfrac{\cos t}{\cos t} = \dfrac{1 - \cos^2 t}{1} =$ Lado Der

45. Lado Izq $= \dfrac{1}{\cos^2 y} = \sec^2 y =$ Lado Der

47. Lado Izq $= \cot x\cos x + \cot x - \csc x\cos x - \csc x$
$= \dfrac{\cos^2 x}{\operatorname{sen} x} + \dfrac{\cos x}{\operatorname{sen} x} - \dfrac{\cos x}{\operatorname{sen} x} - \dfrac{1}{\operatorname{sen} x} = \dfrac{\cos^2 x - 1}{\operatorname{sen} x}$
$= \dfrac{-\operatorname{sen}^2 x}{\operatorname{sen} x} =$ Lado Der

49. Lado Izq $= \operatorname{sen}^2 x\left(1 + \dfrac{\cos^2 x}{\operatorname{sen}^2 x}\right) = \operatorname{sen}^2 x + \cos^2 x =$ Lado Der

51. Lado Izq $= 2(1 - \operatorname{sen}^2 x) - 1 = 2 - 2\operatorname{sen}^2 x - 1 =$ Lado Der

53. Lado Izq $= \dfrac{1 - \cos\alpha}{\operatorname{sen}\alpha} \cdot \dfrac{1 + \cos\alpha}{1 + \cos\alpha}$
$= \dfrac{1 - \cos^2\alpha}{\operatorname{sen}\alpha(1 + \cos\alpha)} = \dfrac{\operatorname{sen}^2\alpha}{\operatorname{sen}\alpha(1 + \cos\alpha)} =$ Lado Der

55. Lado Izq $= \dfrac{\operatorname{sen}^2\theta}{\cos^2\theta} - \dfrac{\operatorname{sen}^2\theta\cos^2\theta}{\cos^2\theta}$
$= \dfrac{\operatorname{sen}^2\theta(1 - \cos^2\theta)}{\cos^2\theta} = \dfrac{\operatorname{sen}^2\theta\operatorname{sen}^2\theta}{\cos^2\theta} =$ Lado Der

57. Lado Izq $= \dfrac{\operatorname{sen} x - 1}{\operatorname{sen} x + 1} \cdot \dfrac{\operatorname{sen} x + 1}{\operatorname{sen} x + 1} = \dfrac{\operatorname{sen}^2 x - 1}{(\operatorname{sen} x + 1)^2} =$ Lado Der