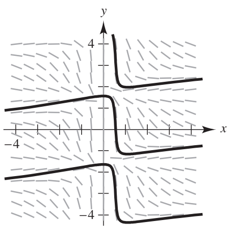
APPENDIX C

Appendix C.1 *(page C6)*

1. $x^2 - 3xy + y^2 = C$ **3.** $3xy^2 + 5x^2y^2 - 2y = C$

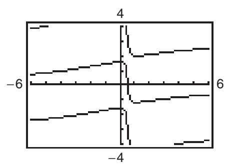
5. Not exact **7.** $\arctan \dfrac{x}{y} = C$ **9.** Not exact

11. (a) Answers will vary.



(b) $x^2 \tan y + 5x = \dfrac{11}{4}$

(c)



13. $y \ln(x - 1) + y^2 = 16$ **15.** $e^{3x} \sin 3y = 0$

17. Integrating factor: $\dfrac{1}{y^2}$

$\dfrac{x}{y} - 6y = C$

19. Integrating factor: $\dfrac{1}{x^2}$

$\dfrac{y}{x} + 5x = C$

21. Integrating factor: $\cos x$

$y \sin x + x \sin x + \cos x = C$

23. Integrating factor: $\dfrac{1}{y}$

$xy - \ln y = C$

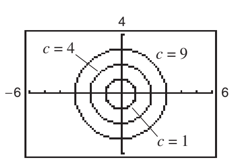
25. Integrating factor: $\dfrac{1}{\sqrt{y}}$

$x\sqrt{y} + \cos\sqrt{y} = C$

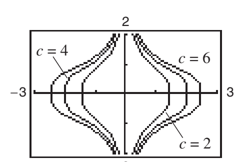
27. $x^4y^3 + x^2y^4 = C$

29. $\dfrac{y^2}{x} + \dfrac{x}{y^2} + C$ **31.** Proof

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



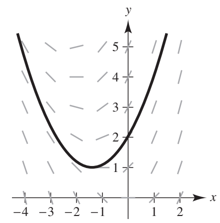
35. $2x^2y^4 + x^2 = C$



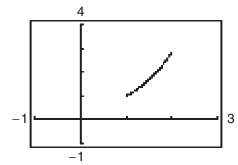
37. $x^2 - 2xy + 3y^2 = 3$ **39.** $C = \dfrac{5\left(x^2 + \sqrt{x^4 - 1{,}000{,}000x}\right)}{x}$

41.

Δx	0.50	0.25	0.10
Estimate	3.7798	3.9875	4.1207

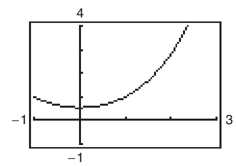


43. (a)

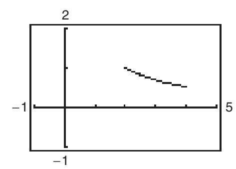


(b) $3y^{2/3} - x^2 = 2$

(c)

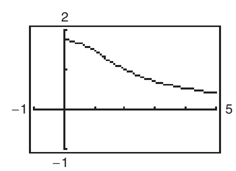


45. (a)

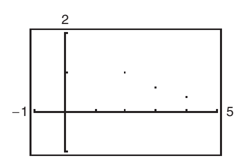


(b) $y^2(2x^2 + y^2) = 9$

(c)

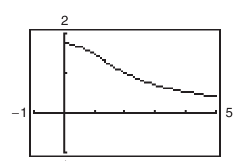


47. (a)



(b) $y^2(2x^2 + y^2) = 9$

(c)



Less accurate

49. False; $\dfrac{\partial M}{\partial y} = 2x$, $\dfrac{\partial N}{\partial x} = -2x$.

50. False; $ydx + xdy = 0$ is exact, but $xydx + x^2dy = 0$ is not exact.

51. True **52.** True

Appendix C.2 *(page C14)*

1. Proof **3.** Proof **5.** $y = C_1 + C_2e^x$

7. $y = C_1e^{3x} + C_2e^{-2x}$ **9.** $y = C_1e^{x/2} + C_2e^{-2x}$

11. $y = C_1e^{-3x} + C_2xe^{-3x}$ **13.** $y = C_1e^{x/4} + C_2xe^{x/4}$

15. $y = C_1 \sin x + C_2 \cos x$ **17.** $y = C_1e^{3x} + C_2e^{-3x}$

19. $y = e^x\left(C_1 \sin\sqrt{3}x + C_2 \cos\sqrt{3}x\right)$

21. $y = C_1e^{(3+\sqrt{5})x/2} + C_2e^{(3-\sqrt{5})x/2}$

23. $y = e^{2x/3}\left(C_1 \sin\dfrac{\sqrt{7}x}{3} + C_2 \cos\dfrac{\sqrt{7}x}{3}\right)$

25. $y = C_1e^x + C_2e^{-x} + C_3 \sin x + C_4 \cos x$

27. $y = C_1e^x + C_2e^{2x} + C_3e^{3x}$

29. $y = C_1e^x + e^x(C_2 \sin 2x + C_3 \cos 2x)$

31. (a) $y = 2 \cos 10x$ (b) $y = \frac{1}{5} \sin 10x$
(c) $y = -\cos 10x + \frac{3}{10} \sin 10x$

33. $y = \frac{1}{11}(e^{6x} + 10e^{-5x})$

35. $y = \dfrac{1}{2} \sin 4x$

37. y'' and y' are not equal for $x < 0$. $y'' > 0$ for all x, but $y' < 0$ for $x < 0$.

39. $y = \frac{1}{2} \cos 4\sqrt{3}t$

41. $y = \dfrac{2}{3} \cos 4\sqrt{3}t - \dfrac{\sqrt{3}}{24} \sin 4\sqrt{3}t$

43. $y = \dfrac{e^{-t/16}}{2}\left(\cos\dfrac{\sqrt{12{,}287}\,t}{16} + \dfrac{\sqrt{12{,}287}}{12{,}287} \sin\dfrac{\sqrt{12{,}287}\,t}{16}\right)$

45. b **46.** d **47.** c **48.** a **49.** Proof

51. False; the general solution is $y = C_1e^{3x} + C_2xe^{3x}$.

52. True **53.** True

54. False; the solution $y = x^2e^x$ requires that $m = 1$ is a triple zero of the characteristic equation. Because the characteristic equation is quadratic, $m = 1$ can be at most a double zero.

55. Proof **57.** Proof

59. (a) Proof (b) $y = \dfrac{C_1}{x^3} + \dfrac{C_2}{x^2}$

Appendix C.3 *(page C22)*

1. Proof **3.** Proof **5.** $y = C_1e^x + C_2e^{2x} + x + \frac{3}{2}$

7. $y = \cos x + 6 \sin x + x^3 - 6x$

9. $y = C_1 + C_2e^{-2x} + \frac{2}{3}e^x$

11. $y = (C_1 + C_2x)e^{5x} + \frac{3}{8}e^x + \frac{1}{5}$

13. $y = -1 + 2e^{-x} - \cos x - \sin x$

15. $y = \left(C_1 - \dfrac{x}{6}\right)\cos 3x + C_2 \sin 3x$

17. $y = C_1e^x + C_2xe^x + \left(C_3 + \dfrac{2x}{9}\right)e^{-2x}$

19. $y = \left(\dfrac{4}{9} - \dfrac{1}{2}x^2\right)e^{4x} - \dfrac{1}{9}(1 + 3x)e^x$

21. (a) $y''_p = 0$ and $3y_p = 12$ (b) $y_p = 2$ (c) $y_p = 4$

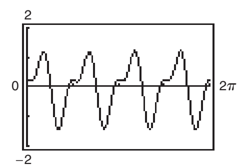
23. $y = (C_1 + \ln|\cos x|)\cos x + (C_2 + x)\sin x$

25. $y = \left(C_1 - \dfrac{x}{2}\right)\cos 2x + \left(C_2 + \dfrac{1}{4} \ln|\sin 2x|\right)\sin 2x$

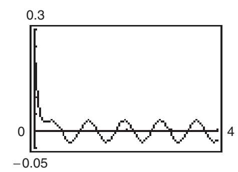
27. $y = (C_1 + C_2x)e^x + \dfrac{x^2e^x}{4}(\ln x^2 - 3)$

29. $q = \frac{3}{25}(e^{-5t} + 5te^{-5t} - \cos 5t)$

31. $y = \frac{1}{4} \cos 8t - \frac{1}{2} \sin 8t + \sin 4t$



33. $y = \left(\frac{9}{32} - \frac{3}{4}t\right)e^{-8t} - \frac{1}{32} \cos 8t$



35. $y = \dfrac{\sqrt{5}}{4} \sin\left(8t - \arctan\dfrac{1}{2}\right)$
$= \dfrac{\sqrt{5}}{4} \sin(8t - 0.4636)$

37. Proof

39. $y = C_1x + C_2x \ln x + \frac{2}{3}x(\ln x)^3$

Appendix C.4 *(page C27)*

1. Proof **3.** Proof **5.** Proof

7. $y = a_0\displaystyle\sum_{k=0}^{\infty} \frac{(-3)^k}{2^k k!} x^{2k}$

Interval of convergence: $(-\infty, \infty)$

9. $y = a_0 + a_1\displaystyle\sum_{k=0}^{\infty} \frac{x^{2x+1}}{2^k(k!)(2k + 1)}$

Interval of convergence: $(-\infty, \infty)$

11. $y = a_0\left(1 - \dfrac{x^2}{8} + \dfrac{x^4}{128} - \cdots\right) +$
$a_1\left(x - \dfrac{x^3}{24} + \dfrac{7x^5}{1920} - \ldots\right)$

13. Taylor's Theorem: $y = 2 + \frac{2x}{1!} - \frac{2x^2}{2!} - \frac{10x^3}{3!} + \frac{2x^4}{4!} + \cdots$

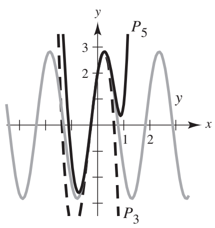
$y\left(\frac{1}{2}\right) \approx 2.547$

Euler's Method: $y\left(\frac{1}{2}\right) \approx 2.672$

15. (a) $y = 2(\cos 3x + \sin 3x)$

(b) $y = 2\left[\sum_{n=0}^{\infty} \frac{(-1)^n(3x)^{2n}}{(2n)!} + \sum_{n=0}^{\infty} \frac{(-1)^n(3x)^{2n+1}}{(2n+1)!}\right]$

(c)



17. $y = 1 - \frac{3x}{1!} + \frac{2x^3}{3!} - \frac{12x^4}{4!} + \frac{16x^6}{6!} - \frac{120x^7}{7!} + \cdots$

$y\left(\frac{1}{4}\right) \approx 0.253$

19. Proof **21.** Proof

23. $y = a_0 + a_1x + \frac{a_0}{6}x^3 + \frac{a_1}{12}x^4 + \frac{a_0}{180}x^6 + \frac{a_1}{504}x^7$

APPENDIX D

Appendix D.1 *(page D8)*

1. Rational **3.** Irrational **5.** Rational **7.** Rational
9. Rational **11.** $\frac{4}{11}$ **13.** $\frac{11}{37}$

15. (a) True (b) False (c) True (d) False (e) False (f) False

17. x is greater than -3 and less than 3.

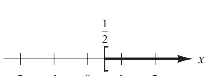
The interval is bounded.

19. x is no more than 5.

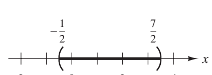
The interval is unbounded.

21. $y \ge 4$, $[4, \infty)$ **23.** $0.03 < r \le 0.07$, $(0.03, 0.07]$

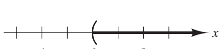
25. $x \ge \frac{1}{2}$



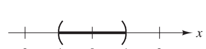
27. $-\frac{1}{2} < x < \frac{7}{2}$



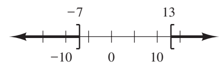
29. $x > 6$



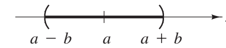
31. $-1 < x < 1$



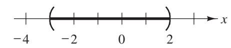
33. $x \ge 13$, $x \le -7$



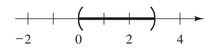
35. $a - b < x < a + b$



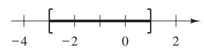
37. $-3 < x < 2$



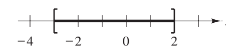
39. $0 < x < 3$



41. $-3 \le x \le 1$



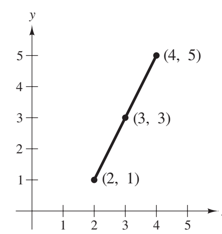
43. $-3 \le x \le 2$



45. 4, -4, 4 **47.** (a) $-51, 51, 51$ (b) $51, -51, 51$
49. $|x| \le 2$ **51.** $|x - 2| > 2$
53. (a) $|x - 12| \le 10$ (b) $|x - 12| \ge 10$
55. 1 **57.** (a) 14 (b) 10
59. $x \ge 36$ units **61.** $x \le 41$ or $x \ge 59$
63. (a) $\frac{355}{112} > \pi$ (b) $\frac{22}{7} > \pi$ **65.** b
67. False; the reciprocal of 2 is $\frac{1}{2}$, which is not an integer.
68. True **69.** True **70.** False; $|0| = 0$. **71.** True
72. True **73.** Proof **75.** Proof **77.** Proof
79. Proof
81. $|-3 - 1| > |-3| - |1|$
$|3 - 1| = |3| - |1|$

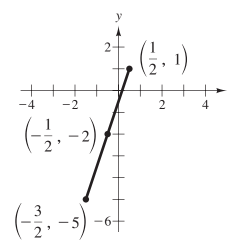
Appendix D.2 *(page D15)*

1. (a)



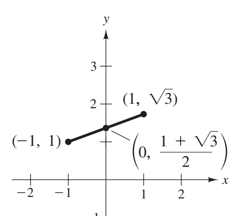
(b) $2\sqrt{5}$
(c) (3, 3)

3. (a)



(b) $2\sqrt{10}$
(c) $\left(-\frac{1}{2}, -2\right)$

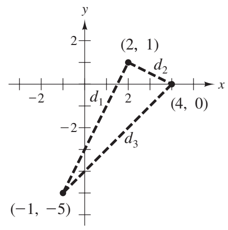
5. (a)



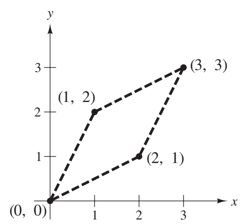
(b) $8\sqrt{8 - 2\sqrt{3}}$
(c) $\left(0, \frac{1 \pm \sqrt{3}}{2}\right)$

7. Quadrant II **9.** Quadrants I and III

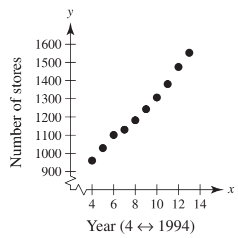
11. Right triangle:
$d_1 = \sqrt{45}, d_2 = \sqrt{5}$
$d_3 = \sqrt{50}$
$(d_1)^2 + (d_2)^2 = (d_3)^2$



13. Rhombus: the length of each side is $\sqrt{5}$.



15.



17. $d_1 = 2\sqrt{5}, d_2 = \sqrt{5}, d_3 = 3\sqrt{5}$
Collinear, because $d_1 + d_2 = d_3$.

19. $d_1 = \sqrt{2}, d_2 = \sqrt{13}, d_3 = 5$
Not collinear, because $d_1 + d_2 > d_3$.

21. $x = \pm 3$ **23.** $y = \pm\sqrt{55}$

25. $\left(\frac{3x_1 + x_2}{4}, \frac{3y_1 + y_2}{4}\right)$ $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$
$\left(\frac{x_1 + 3x_2}{4}, \frac{y_1 + 3y_2}{4}\right)$

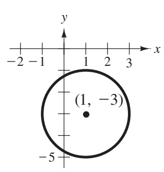
27. c **28.** b **29.** a **30.** d **31.** $x^2 + y^2 - 9 = 0$

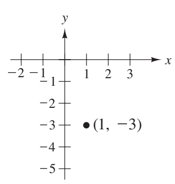
33. $x^2 + y^2 - 4x + 2y - 11 = 0$

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

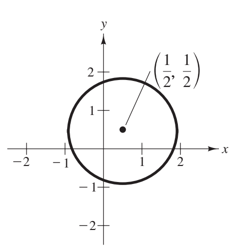
37. $x^2 + y^2 - 6x - 4y + 3 = 0$ **39.** $x^2 + y^2 = 26{,}000^2$

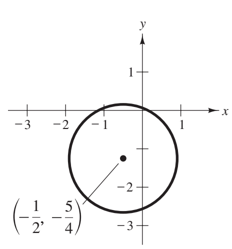
41. $(x - 1)^2 + (y + 3)^2 = 4$ **43.** $(x - 1)^2 + (y + 3)^2 = 0$



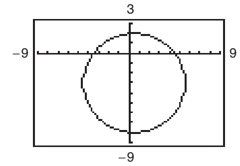


45. $\left(x - \frac{1}{2}\right)^2 + \left(y - \frac{1}{2}\right)^2 = 2$ **47.** $\left(x + \frac{1}{2}\right)^2 + \left(y + \frac{5}{4}\right)^2 = \frac{9}{4}$

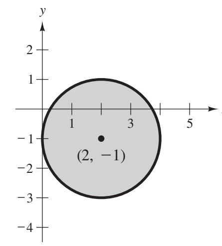




49.



51.



53. Proof **55.** True **56.** False; the distance is $|2b|$.

57. True **58.** True **59.** Proof **61.** Proof

Appendix D.3 *(page D25)*

1. (a) $396°, -324°$ (b) $240°, -480°$

3. (a) $\frac{19\pi}{9}, -\frac{17\pi}{9}$ (b) $\frac{10\pi}{3}, -\frac{2\pi}{3}$

5. (a) $\frac{\pi}{6}$, 0.524 (b) $\frac{5\pi}{6}$, 2.618

(c) $\frac{7\pi}{4}$, 5.498 (d) $\frac{2\pi}{3}$, 2.094

7. (a) $270°$ (b) $210°$ (c) $-105°$ (d) $-135.6°$

9.

r	8 ft	15 in.	85 cm	24 in.	$\frac{12{,}963}{\pi}$ mi
s	12 ft	24 in.	63.75π cm	96 in.	8642 mi
θ	1.5	1.6	$\frac{3\pi}{4}$	4	$\frac{2\pi}{3}$

11. (a) $\sin\theta = \frac{4}{5}$ $\csc\theta = \frac{5}{4}$
$\cos\theta = \frac{3}{5}$ $\sec\theta = \frac{5}{3}$
$\tan\theta = \frac{4}{3}$ $\cot\theta = \frac{3}{4}$

(b) $\sin\theta = -\frac{5}{13}$ $\csc\theta = -\frac{13}{5}$
$\cos\theta = -\frac{12}{13}$ $\sec\theta = -\frac{13}{12}$
$\tan\theta = \frac{5}{12}$ $\cot\theta = \frac{12}{5}$

13. (a) Quadrant III (b) Quadrant IV

15. $\frac{\sqrt{3}}{2}$ **17.** $\frac{4}{3}$

19. (a) $\sin 60° = \frac{\sqrt{3}}{2}$
$\cos 60° = \frac{1}{2}$
$\tan 60° = \sqrt{3}$

(b) $\sin 120° = \frac{\sqrt{3}}{2}$
$\cos 120° = -\frac{1}{2}$
$\tan 120° = -\sqrt{3}$

(c) $\sin\frac{\pi}{4} = \frac{\sqrt{2}}{2}$
$\cos\frac{\pi}{4} = \frac{\sqrt{2}}{2}$
$\tan\frac{\pi}{4} = 1$

(d) $\sin\frac{5\pi}{4} = -\frac{\sqrt{2}}{2}$
$\cos\frac{5\pi}{4} = -\frac{\sqrt{2}}{2}$
$\tan\frac{5\pi}{4} = 1$

21. (a) $\sin 225° = -\frac{\sqrt{2}}{2}$ (b) $\sin(-225°) = \frac{\sqrt{2}}{2}$

$\cos 225° = -\frac{\sqrt{2}}{2}$ $\cos(-225°) = -\frac{\sqrt{2}}{2}$

$\tan 225° = 1$ $\tan(-225°) = -1$

(c) $\sin\frac{5\pi}{3} = -\frac{\sqrt{3}}{2}$ (d) $\sin\frac{11\pi}{6} = -\frac{1}{2}$

$\cos\frac{5\pi}{3} = \frac{1}{2}$ $\cos\frac{11\pi}{6} = \frac{\sqrt{3}}{2}$

$\tan\frac{5\pi}{3} = -\sqrt{3}$ $\tan\frac{11\pi}{6} = -\frac{\sqrt{3}}{3}$

23. (a) 0.1736 (b) 5.759 **25.** (a) 0.3640 (b) 0.3640

27. (a) $\theta = \frac{\pi}{4}, \frac{7\pi}{4}$ (b) $\theta = \frac{3\pi}{4}, \frac{5\pi}{4}$

29. (a) $\theta = \frac{\pi}{4}, \frac{5\pi}{4}$ (b) $\theta = \frac{5\pi}{6}, \frac{11\pi}{6}$

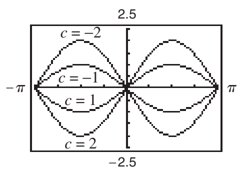
31. $\theta = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$ **33.** $\theta = 0, \frac{\pi}{4}, \pi, \frac{5\pi}{4}$

35. $\theta = \frac{\pi}{3}, \frac{5\pi}{3}$ **37.** $\theta = 0, \frac{\pi}{2}, \pi$ **39.** 5099 feet

41. (a) Period: π (b) Period: 2 **43.** Period: $\frac{1}{2}$
Amplitude: 2 Amplitude: $\frac{1}{2}$ Amplitude: 3

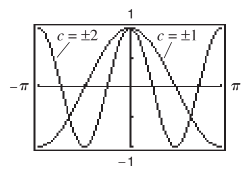
45. Period: $\frac{\pi}{2}$ **47.** Period: $\frac{2\pi}{5}$

49. (a)



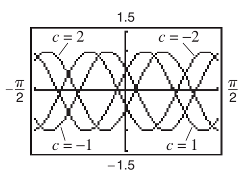
Change in amplitude

(b)



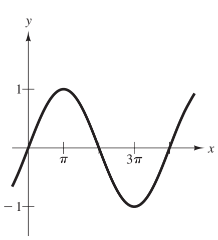
Change in period

(c)

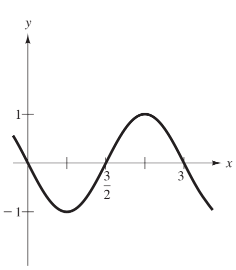


Horizontal translation

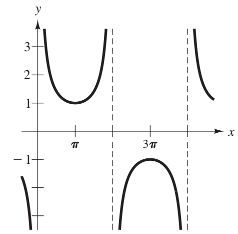
51.



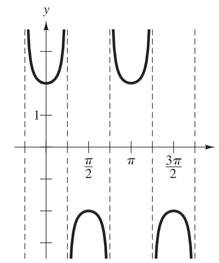
53.



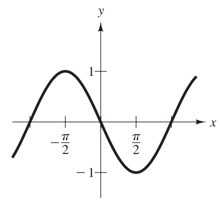
55.



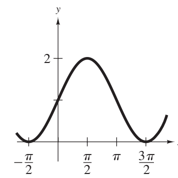
57.



59.

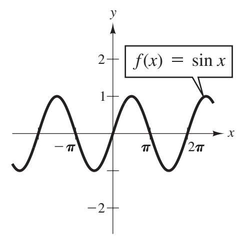


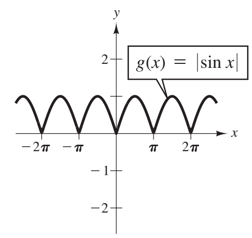
61.

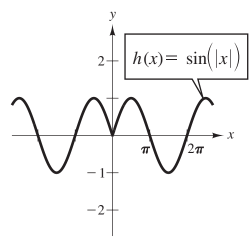


63. $a = 3, b = \frac{1}{2}, c = \frac{\pi}{2}$

65.

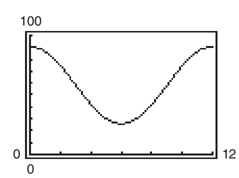






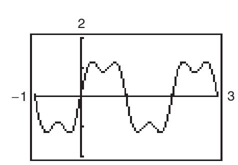
The graph of $|f(x)|$ will reflect any parts of the graph of $f(x)$ below the x-axis about the x-axis. The graph of $f(|x|)$ will reflect the part of the graph of $f(x)$ left of the y-axis about the x-axis.

67.



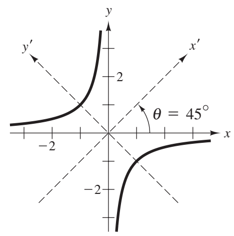
January, November, December

69. $f(x) = \frac{4}{\pi}\left(\sin \pi x + \frac{1}{3}\sin 3\pi x + \frac{1}{5}\sin 5\pi x + \cdots\right)$

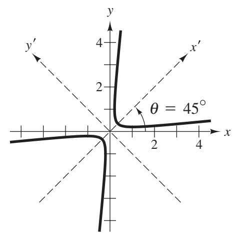


APPENDIX E *(page E6)*

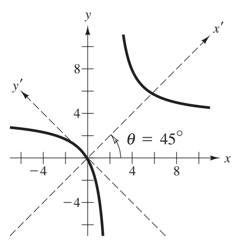
1. $\dfrac{(y')^2}{2} - \dfrac{(x')^2}{2} = 1$



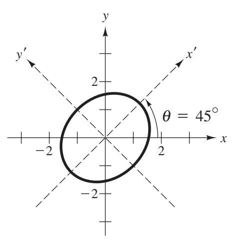
3. $\dfrac{(x')^2}{1/4} - \dfrac{(y')^2}{1/6} = 1$



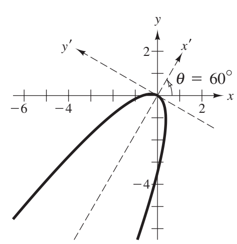
5. $\dfrac{\left(x' - 3\sqrt{2}\right)^2}{16} - \dfrac{\left(y' - \sqrt{2}\right)^2}{16} = 1$



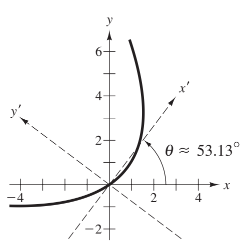
7. $\dfrac{(x')^2}{3} + \dfrac{(y')^2}{2} = 1$



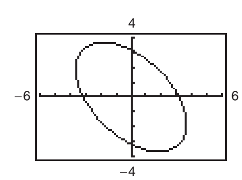
9. $x' = -(y')^2$



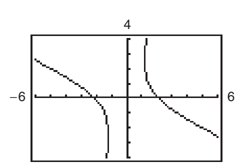
11. $y' = \dfrac{(x')^2}{6} - \dfrac{x'}{3}$



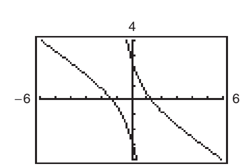
13. $\theta = 45^\circ$



15. $\theta \approx 26.57^\circ$

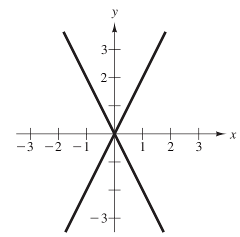


17. $\theta \approx 31.72^\circ$

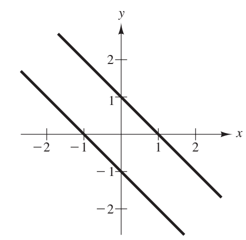


19. Parabola **21.** Ellipse **23.** Hyperbola **25.** Parabola

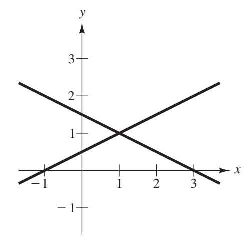
27. Two lines



29. Two parallel lines



31. Two lines



33. Proof

APPENDIX F *(page F10)*

1. $11 - i$ **3.** 4 **5.** $3 - 3\sqrt{2}i$ **7.** $-14 + 20i$

9. $\frac{1}{6} + \frac{7}{6}i$ **11.** $-2\sqrt{3}$ **13.** -10 **15.** $5 + i$

17. $12 + 30i$ **19.** 24 **21.** $-9 + 40i$ **23.** -10

25. $5 - 3i$; 34 **27.** $-2 + \sqrt{5}i$; 9 **29.** $-20i$; 400

31. $\sqrt{8}$; 8 **33.** $-6i$ **35.** $\frac{16}{41} + \frac{20}{41}i$ **37.** $\frac{3}{5} + \frac{4}{5}i$

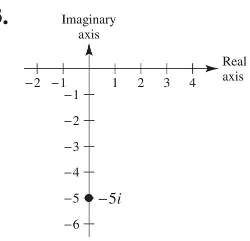
39. $-7 - 6i$ **41.** $-\frac{9}{1681} + \frac{40}{1681}i$ **43.** $-\frac{1}{2} - \frac{5}{2}i$

45. $\frac{62}{949} + \frac{297}{949}i$ **47.** $1 \pm i$ **49.** $-2 \pm \frac{1}{2}i$ **51.** $-\frac{5}{2}, -\frac{3}{2}$

53. $\dfrac{1}{8} \pm \dfrac{\sqrt{11}}{8}i$ **55.** $-1 + 6i$ **57.** $-5i$

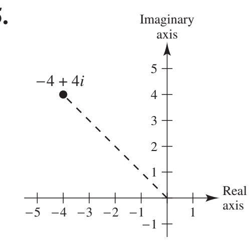
59. $-375\sqrt{3}i$ **61.** i

63.



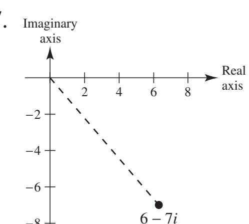
5

65.



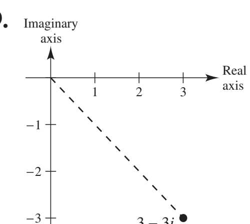
$4\sqrt{2}$

67.



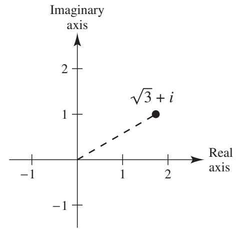
$\sqrt{85}$

69.



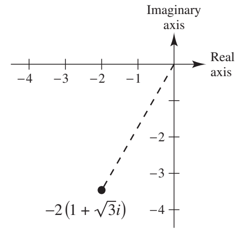
$3\sqrt{2}\left(\cos\dfrac{7\pi}{4} + i\sin\dfrac{7\pi}{4}\right)$

71.



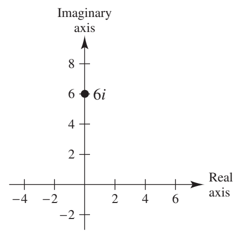
$2\left(\cos\dfrac{\pi}{6} + i\sin\dfrac{\pi}{6}\right)$

73.



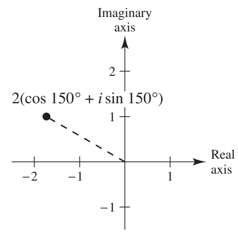
$4\left(\cos\dfrac{4\pi}{3} + i\sin\dfrac{4\pi}{3}\right)$

75.



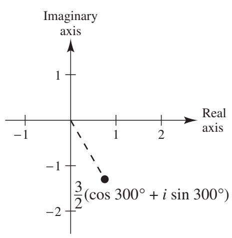
$6\left(\cos\dfrac{\pi}{2} + i\sin\dfrac{\pi}{2}\right)$

77.



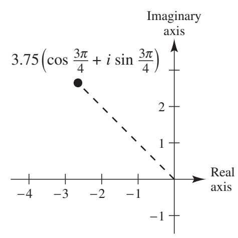
$-\sqrt{3} + i$

79.



$\dfrac{3}{4} - \dfrac{3\sqrt{3}}{4}i$

81.



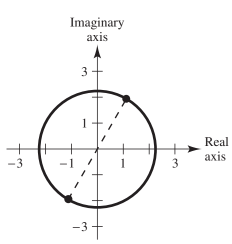
$\dfrac{-15\sqrt{2}}{8} + \dfrac{15\sqrt{2}}{8}i$

83. $12\left(\cos\dfrac{\pi}{2} + i\sin\dfrac{\pi}{2}\right)$ **85.** $\dfrac{10}{9}(\cos 200° + i\sin 200°)$

87. $-4 - 4i$ **89.** $-32i$ **91.** $-128\sqrt{3} - 128i$ **93.** i

95. (a) $\sqrt{5}(\cos 60° + i\sin 60°)$
$\sqrt{5}(\cos 240° + i\sin 240°)$

(b)



(c) $\dfrac{\sqrt{5}}{2} + \dfrac{\sqrt{15}}{2}i, -\dfrac{\sqrt{5}}{2} - \dfrac{\sqrt{15}}{2}i$

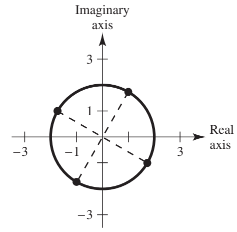
97. (a) $2\left(\cos\dfrac{\pi}{3} + i\sin\dfrac{\pi}{3}\right)$

$2\left(\cos\dfrac{5\pi}{6} + i\sin\dfrac{5\pi}{6}\right)$

$2\left(\cos\dfrac{4\pi}{3} + i\sin\dfrac{4\pi}{3}\right)$

$2\left(\cos\dfrac{11\pi}{6} + i\sin\dfrac{11\pi}{6}\right)$

(b)



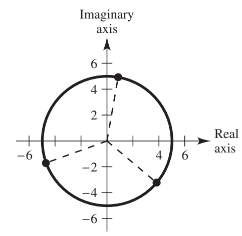
(c) $1 + \sqrt{3}i, -\sqrt{3} + i, -1 - \sqrt{3}i, \sqrt{3} - i$

99. (a) $5\left(\cos\dfrac{4\pi}{9} + i\sin\dfrac{4\pi}{9}\right)$

$5\left(\cos\dfrac{10\pi}{9} + i\sin\dfrac{10\pi}{9}\right)$

$5\left(\cos\dfrac{16\pi}{9} + i\sin\dfrac{16\pi}{9}\right)$

(b)

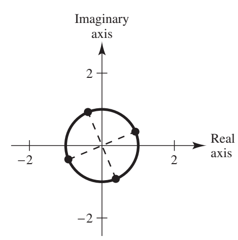


101. $\cos\dfrac{\pi}{8} + i\sin\dfrac{\pi}{8}$

$\cos\dfrac{5\pi}{8} + i\sin\dfrac{5\pi}{8}$

$\cos\dfrac{9\pi}{8} + i\sin\dfrac{9\pi}{8}$

$\cos\dfrac{13\pi}{8} + i\sin\dfrac{13\pi}{8}$



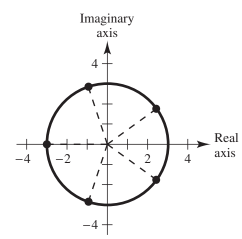
103. $3\left(\cos\dfrac{\pi}{5} + i\sin\dfrac{\pi}{5}\right)$

$3\left(\cos\dfrac{3\pi}{5} + i\sin\dfrac{3\pi}{5}\right)$

$3(\cos\pi + i\sin\pi)$

$3\left(\cos\dfrac{7\pi}{5} + i\sin\dfrac{7\pi}{5}\right)$

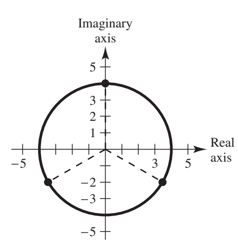
$3\left(\cos\dfrac{9\pi}{5} + i\sin\dfrac{9\pi}{5}\right)$



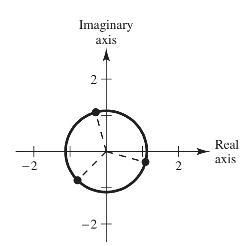
105. $4\left(\cos\dfrac{\pi}{2} + i\sin\dfrac{\pi}{2}\right)$

$4\left(\cos\dfrac{7\pi}{6} + i\sin\dfrac{7\pi}{6}\right)$

$4\left(\cos\dfrac{11\pi}{6} + i\sin\dfrac{11\pi}{6}\right)$



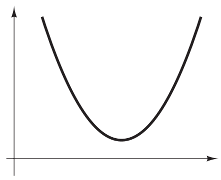
107. $\sqrt[6]{2}(\cos 105° + i\sin 105°)$
$\sqrt[6]{2}(\cos 225° + i\sin 225°)$
$\sqrt[6]{2}(\cos 345° + i\sin 345°)$



APPENDIX G *(page G5)*

1. (a) Fixed cost

(b)



(c) Yes, it occurs when production costs are increasing at their slowest rate.

3. 4500 **5.** 300 **7.** 200 **9.** 200
11. \$60 **13.** \$35 **15.** $x = 3$ **17.** Proof

19. (a)

Order size, x	*Price*	*Profit, P*
102	$90 - 2(0.15)$	$102[90 - 2(0.15)] - 102(60) = 3029.40$
104	$90 - 4(0.15)$	$104[90 - 4(0.15)] - 104(60) = 3057.60$
106	$90 - 6(0.15)$	$106[90 - 6(0.15)] - 106(60) = 3084.60$
108	$90 - 8(0.15)$	$108[90 - 8(0.15)] - 108(60) = 3110.40$
110	$90 - 10(0.15)$	$110[90 - 10(0.15)] - 110(60) = 3135.00$
112	$90 - 12(0.15)$	$112[90 - 12(0.15)] - 112(60) = 3158.40$

(b)

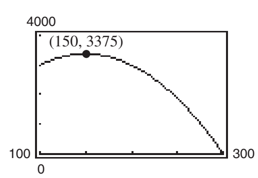
Order size, x	*Price*	*Profit, P*
⋮	⋮	⋮
146	$90 - 46(0.15)$	$146[90 - 46(0.15)] - 146(60) = 3372.60$
148	$90 - 48(0.15)$	$148[90 - 48(0.15)] - 148(60) = 3374.40$
150	$90 - 50(0.15)$	$150[90 - 50(0.15)] - 150(60) = 3375.00$
152	$90 - 52(0.15)$	$152[90 - 52(0.15)] - 152(60) = 3374.40$
154	$90 - 54(0.15)$	$154[90 - 54(0.15)] - 154(60) = 3372.60$
⋮	⋮	⋮

Maximum profit: \$3375.00

(c) $P = x[90 - (x - 100)(0.15)] - x(60) = 45x - 0.15x^2,$
$x \geq 100$

(d) 150 units

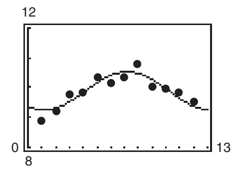
(e)



21. Line should run from the power station to a point across the river $3/(2\sqrt{7})$ mile downstream.

23. $x \approx 40$ units **25.** \$30,000

27. (a)

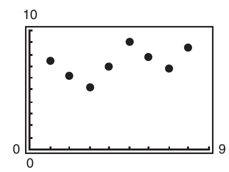


(b) July

(c) The cosine factor; 9.90

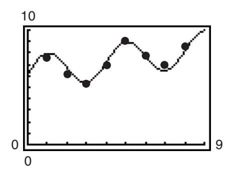
(d) $0.02t$ would mean a steady growth of sales over time. In this case, the maximum sales in 2008 (that is, on $49 \leq t \leq 60$) would be about 11.6 thousand gallons.

29. (a)



(b) $y = 6.2 + 0.25x + 1.5 \sin\left(\frac{\pi}{2}x\right)$

(c)



(d) \$12,000

31. $\eta = -\frac{17}{3}$, elastic **33.** $\eta = -\frac{1}{2}$, inelastic