A

Selected Answers

1.1.1. \((2/3)x + (1/3)\)

1.1.2. \(y = -2x\)

1.1.3. \((-2/3)x + (1/3)\)

1.1.4. \(y = 2x + 2, 2, -1\)

1.1.5. \(y = -x + 6, 6, 6\)

1.1.6. \(y = x/2 + 1/2, 1/2, -1\)

1.1.7. \(y = 3/2, y\)-intercept: 3/2, no x-intercept

1.1.8. \(y = (-2/3)x - 2, -2, -3\)

1.1.9. yes

1.1.10. \(y = 0, y = -2x + 2, y = 2x + 2\)

1.1.11. \(y = 75t\) (t in hours); 164 minutes

1.1.12. \(y = (9/5)x + 32, (-40, -40)\)

1.1.13. \(y = 0.15x + 10\)

1.1.14. 0.03x + 1.2

1.1.15. (a) \(y = \begin{cases} 0 & 0 \leq x < 100 \\ (x/10) - 10 & 100 \leq x \leq 1000 \\ x - 910 & 1000 < x \end{cases}\)

1.1.16. \(y = \begin{cases} 0.15x & 0 \leq x \leq 19450 \\ 0.28x - 2528.50 & 19450 < x \leq 47050 \\ 0.33x - 4881 & 47050 < x \leq 97620 \end{cases}\)

1.1.17. (a) \(P = -0.0001x + 2\)
(b) \(x = -10000P + 20000\)

1.1.18. \((2/25)x - (16/5)\)

1.2.1. (a) \(x^2 + y^2 = 9\)
(b) \((x - 5)^2 + (y - 6)^2 = 9\)
(c) \((x + 5)^2 + (y + 6)^2 = 9\)
(d) \(x^2 + (y - 3)^2 = 9\)
(e) \(x^2 + (y + 3)^2 = 9\)
(f) \((x - 3)^2 + y^2 = 9\)

1.2.2. (a) \(\Delta x = 2, \Delta y = 3, m = 3/2, y = (3/2)x - 3, \sqrt{13}\)
(b) \(\Delta x = -1, \Delta y = 3, m = -3, y = -3x + 2, \sqrt{10}\)
(c) \(\Delta x = -2, \Delta y = -2, m = 1, y = x, \sqrt{8}\)

1.2.6. \((x + 2/7)^2 + (y - 41/7)^2 = 1300/49\)

1.3.1. \(\{x \mid x \geq 3/2\}\)

1.3.2. \(\{x \mid x \neq -1\}\)

295
1.3.3. \( \{ x \mid x \neq 1 \text{ and } x \neq -1 \} \)

1.3.4. \( \{ x \mid x < 0 \} \)

1.3.5. \( \{ x \mid x \in \mathbb{R} \} \), i.e., all \( x \)

1.3.6. \( \{ x \mid x \geq 0 \} \)

1.3.7. \( \{ x \mid h - r \leq x \leq h + r \} \)

1.3.8. \( \{ x \mid x \geq 1 \text{ or } x < 0 \} \)

1.3.9. \( \{ x \mid -\frac{1}{3} < x < \frac{1}{3} \} \)

1.3.10. \( \{ x \mid x \geq 0 \text{ and } x \neq 1 \} \)

1.3.11. \( \{ x \mid x \geq 0 \text{ and } x \neq 1 \} \)

1.3.12. \( \mathbb{R} \)

1.3.13. \( \{ x \mid x \geq 3 \} \), \( \{ x \mid x \geq 0 \} \)

1.3.14. \( A = x(500 - 2x), \{ x \mid 0 \leq x \leq 250 \} \)

1.3.15. \( V = r(50 - \pi r^2), \{ r \mid 0 < r \leq \sqrt{50/\pi} \} \)

1.3.16. \( A = 2\pi r^2 + 2000/r, \{ r \mid 0 < r < \infty \} \)

2.1.1. \(-5, -2.47106145, -2.4067927, -2.400676, -2.4\)

2.1.2. \(-4/3, -24/7, 7/24, 3/4\)

2.1.3. \(-0.107526881, -0.11074197, -0.1110741, -1 \)

2.1.4. \(\frac{3 + 3\Delta x + \Delta x^2}{1 + \Delta x} \to 3\)

2.1.5. \(3.31, 3.03001, 3.0000, 3 + 3\Delta x + \Delta x^2 \to 3\)

2.1.6. \( m \)

2.2.1. \(10, 25/2, 20, 15, 25, 35\).

2.2.2. \(5, 4.1, 4.01, 4.001, 4 + \Delta t \to 4\)

2.2.3. \(-10.29, -9.849, -9.8049, -9.8 - 4.9\Delta t \to -9.8\)

2.3.1. \(7\)

2.3.2. \(5\)

2.3.3. \(0\)

2.3.4. undefined

2.3.5. \(1/6\)

2.3.6. \(0\)

2.3.7. \(3\)

2.3.8. \(172\)

2.3.9. \(0\)

2.3.10. \(2\)

2.3.11. does not exist

2.3.12. \(\sqrt{2}\)

2.3.13. \(3a^2\)

2.3.14. \(512\)

2.3.15. \(-4\)

2.3.16. \(0\)

2.3.18. (a) \(8\), (b) \(6\), (c) \text{dne}, (d) \(-2\), (e) \(-1\), (f) \(8\), (g) \(7\), (h) \(6\), (i) \(3\), (j) \(-3/2\), (k) \(6\), (l) \(2\)

2.4.1. \(-x/\sqrt{169 - x^2}\)

2.4.2. \(-9.8t\)

2.4.3. \(2x + 1/x^2\)

2.4.4. \(2ax + b\)

2.4.5. \(3x^2\)

2.4.8. \(-2/(2x + 1)^{3/2}\)

2.4.9. \(5/(t + 2)^2\)

2.4.10. \(y = -13x + 17\)

2.4.11. \(-8\)

2.5.2. Yes; \(M = 1\)

2.5.3. Yes; \(M = 1\)

2.5.4. No

2.5.5. No

2.5.6. \(-0.5 \text{ or } 1.3 \text{ or } 3.2\)

2.5.7. \(0.2 \text{ or } 1.3\)

3.1.1. \(100x^{99}\)
3.1.2. $-100x^{-101}$
3.1.3. $-5x^{-6}$
3.1.4. $\pi x^{\pi -1}$
3.1.5. $(3/4)x^{-1/4}$
3.1.6. $-(9/7)x^{-16/7}$
3.2.1. $15x^2 + 24x$
3.2.2. $-20x^4 + 6x + 10/x^3$
3.2.3. $-30x + 25$
3.2.4. $6x^2 + 2x - 8$
3.2.5. $3x^2 + 6x - 1$
3.2.6. $9x^2 - x/\sqrt{625 - x^2}$
3.2.7. $y = 13x/4 + 5$
3.2.8. $y = 24x - 48 - \pi^3$
3.2.9. $-49t/5 + 5, -49/5$
3.2.11. $\sum_{k=1}^{n} k a_k x^{k-1}$
3.2.12. $x^3/16 - 3x/4 + 4$
3.3.1. $3x^2(x^3 - 5x + 10) + x^3(3x^2 - 5)$
3.3.2. $(x^2 + 5x - 3)(5x^4 - 18x^2 + 6x - 7) + (2x + 5)(x^5 - 6x^3 + 3x^2 - 7x + 1)$
3.3.3. $\sqrt{625 - x^2}/2\sqrt{x} - x\sqrt{x}/\sqrt{625 - x^2}$
3.3.4. $-1/x^{19}\sqrt{625 - x^2} - 20\sqrt{625 - x^2}/x^{21}$
3.3.5. $f' = 4(2x - 3), y = 4x - 7$
3.4.1. $3x^2/(x^3 - 5x + 10) - x^3(3x^2 - 5)/(x^3 - 5x + 10)^2$
3.4.2. $\frac{2x + 5}{(x^5 - 6x^3 + 3x^2 - 7x + 1)} - \frac{(x^2 + 5x - 3)(5x^4 - 18x^2 + 6x - 7)}{(x^5 - 6x^3 + 3x^2 - 7x + 1)^2}$
3.4.3. $\frac{1}{2\sqrt{x}\sqrt{625 - x^2}} + \frac{x^{3/2}}{(625 - x^2)^{3/2}}$
3.4.4. $\frac{-1}{x^{19}\sqrt{625 - x^2}} - \frac{20\sqrt{625 - x^2}}{x^{21}}$
3.4.5. $y = 17x/4 - 41/4$
3.4.6. $y = 11x/16 - 15/16$
3.4.8. $y = 19/169 - 5x/338$
3.4.9. $13/18$
3.5.1. $4x^3 - 9x^2 + x + 7$
3.5.2. $3x^2 - 4x + 2/\sqrt{x}$
3.5.3. $6(x^2 + 1)^2x$
3.5.4. $\sqrt{169 - x^2} - x^2/\sqrt{169 - x^2}$
3.5.5. $(2x - 4)\sqrt{25 - x^2} - (x^2 - 4x + 5)x/\sqrt{25 - x^2}$
3.5.6. $-x/\sqrt{r^2 - x^2}$
3.5.7. $2x^3/\sqrt{1 + x^4}$
3.5.8. $1/\sqrt[4]{x}(5 - \sqrt{x})^{3/2}$
3.5.9. $6 + 18x$
3.5.10. $2x + 1 + x^2 + x + 1$
3.5.11. $-1/\sqrt[4]{25 - x^2} - \sqrt{25 - x^2}/x^2$
3.5.12. $1/2\left(-169/(x^2 - 1)\right)/\sqrt[169]/x - x$
3.5.13. $3x^2 - 2x + 1/x^2$
3.5.14. $300x/(100 - x^2)^{5/2}$
3.5.15. $1 + 3x^2/(3(x + x^3)^{2/3})$
3.5.16. $\frac{4(x^2 + 1) + x}{2\sqrt{1 + (x^2 + 1)^2}}/2\sqrt{(x^2 + 1)^2 + \sqrt{1 + (x^2 + 1)^2}}$
3.5.17. $5(x + 8)^4$
3.5.18. $-3(4 - x)^2$
3.5.19. $6x(x^2 + 5)^2$
3.5.20. $-12x(6 - 2x)^2$
3.5.21. $24x^2(1 - 4x^3)^{-3}$
3.5.22. $5 + 5/x^2$
3.5.23. $-8(4x - 1)(2x^2 - x + 3)^{-3}$
3.5.24. $1/(x + 1)^2$
3.5.25. $3(8x - 2)/(4x^2 - 2x + 1)^2$
3.5.26. $-3x^2 + 5x - 1$
3.5.27. $6x(2x - 4)^3 + 6(3x^2 + 1)(2x - 4)^2$
3.5.28. $-2/(x - 1)^2$
3.5.29. $4x/(x^2 + 1)^2$
3.5.30. $(x^2 - 6x + 7)/(x - 3)^2$
3.5.31. $-5/(3x - 4)^2$
3.5.32. $60x^4 + 72x^3 + 18x^2 + 18x - 6$
3.5.33. $(5 - 4x)/((2x + 1)^2(x - 3))^2$
3.5.34. $1/(2(2 + 3x)^2)$
3.5.35. $56x^6 + 72x^5 + 110x^4 + 100x^3 + 60x^2 + 28x + 6$
3.5.36. $y = 23x/96 - 29/96$
3.5.37. $y = 3 - 2x/3$
3.5.38. $y = 13x/2 - 23/2$
3.5.39. $y = 2x - 11$
3.5.40. $y = \frac{20 + 2\sqrt{5}}{5\sqrt{4 + \sqrt{5}}}x + \frac{3\sqrt{5}}{5\sqrt{4 + \sqrt{5}}}$

4.1.1. $2n\pi - \pi/2$, any integer $n$
4.1.2. $n\pi \pm \pi/6$, any integer $n$
4.1.3. $(\sqrt{2} + \sqrt{6})/4$
4.1.4. $-(1 + \sqrt{3})/(1 - \sqrt{3}) = 2 + \sqrt{3}$
4.1.11. $t = \pi/2$
4.3.1. 5
4.3.2. 7/2
4.3.3. 3/4
4.3.4. 1
4.3.5. $-\sqrt{2}/2$
4.3.6. 7
4.3.7. 2
4.4.1. $\sin(x)\cos(x)/\sqrt{x}$
4.4.2. $\sin x \sqrt{x}/2 + \sqrt{x} \cos x$
4.4.3. $-\cos x / \sin^2 x$
4.4.4. $(2x + 1) \sin x - (x^2 + x) \cos x / \sin^2 x$
4.4.5. $\sqrt{x} \cos x / \sqrt{1 - \sin^2 x}$
4.5.1. $\cos^2 x - \sin^2 x$
4.5.2. $-\sin x \cos(x)$
4.5.3. $\tan x + x \sec^2 x / 2\sqrt{x} \tan x$
4.5.4. $\sec^2 x(1 + \sin x) - \tan x \cos x / (1 + \sin x)^2$
4.5.5. $-\csc^2 x$
4.5.6. $-\csc x \cot x$
4.5.7. $3x^2 \sin(23x^2) + 46x^4 \cos(23x^2)$
4.5.8. 0
4.5.9. $-6 \cos(\cos(6x)) \sin(6x)$
4.5.10. $\sec \theta \tan \theta / (1 + \sec \theta)^2 = \sin \theta / (\cos \theta + 1)^2$
4.5.11. $5t^4 \cos(6t) - 6t^5 \sin(6t)$
4.5.12. $3t^2 (\sin(3t) + t \cos(3t))/\cos(2t) + 2t^3 \sin(3t) \sin(2t)/\cos^2(2t)$
4.5.13. $n\pi/2$, any integer $n$
4.5.14. $\pi/2 + n\pi$, any integer $n$
4.5.15. $y = \sqrt{3x/2 + 3/4 - \sqrt{3}\pi/6}$
4.5.16. $y = 8\sqrt{3x/2 - 8\sqrt{3}\pi/3}$
4.5.17. $y = 3\sqrt{3x/2 - \sqrt{3}\pi/4}$
4.5.18. $\pi/6 + 2n\pi$, $5\pi/6 + 2n\pi$, any integer $n$
4.6.1. $7 \log_{10}(x + 45) + \log_{10}(x - 2)$
4.6.2. $3 \log_2 x - \log_2(3x - 5 + (7/x))$
4.6.3. $\log_2(3x(x - 2)^17/(x^2 + 4x + 1)^2)$
4.6.4. $63^2$
4.6.5. $\pm \sqrt{3}$
4.7.1. $2 \ln(3)x^3e^2$
4.7.2. $\cos x - \sin x \over e^x$
4.7.3. $2e^{2x}$
4.7.4. $e^x \cos(e^x)$
4.7.5. $\cos(x)e^{\sin x}$
4.7.6. $x^{\sin x} \left( \cos x \ln x + \frac{\sin x}{x} \right)$
4.7.7. $3x^2e^x + x^3e^x$
4.7.8. $1 + 2^x \ln(2)$
4.7.9. $-2x \ln(3)(1/3)^x$
4.7.10. $e^{4x}(4x - 1)/x^2$
4.7.11. $(3x^2 + 3)/(x^3 + 3x)$
4.7.12. $-\tan(x)$
4.7.13. $(1 - \ln(x^2))/(x^2 \sqrt{\ln(x^2)})$
4.7.14. $\sec(x)$
4.7.15. $x^{\cos x} \left( \cos(x)/x - \sin(x) \ln(x) \right)$
4.7.16. $\ln x + 1$
4.7.17. $1/(x \ln(3x))$
4.7.18. $\frac{1+\ln(16/3)}{x(1+\ln(4x))^2}$
4.7.19. $\frac{-22x^3 + 537x^2 + 276x}{13824(2x - 3)^9 \sqrt{x - 23}}$
4.7.20. $e$
4.7.21. $3e^{2/3}/(e + 2)$
4.8.1. $x/y$
4.10.4. 0
4.10.5. 0
4.10.6. 1
4.10.7. 1/6
4.10.8. $-\infty$
4.10.9. 1/16
4.10.10. 1/3
4.10.11. 0
4.10.12. 3/2
4.10.13. $-1/4$
4.10.14. $-3$
4.10.15. 1/2
4.10.16. 0
4.10.17. $-1$
4.10.18. $-1/2$
4.10.19. 5
4.10.20. $\infty$
4.10.21. $\infty$
4.10.22. 2/7
4.10.23. 2
4.10.24. $-\infty$
4.10.25. 1
4.10.26. 1
4.10.27. 2
4.10.28. 1
4.10.29. 0
4.10.30. 1/2
4.10.31. 2
4.10.32. 0
4.10.33. $\infty$
4.10.34. 1/2
4.10.35. 0
4.10.36. 1/2
4.10.37. 5
4.10.38. $2\sqrt{2}$
4.10.39. $-1/2$
4.10.40. 2
4.10.41. 0
4.10.42. $\infty$
4.10.43. 0
4.10.44. 3/2
4.10.45. $\infty$
4.10.46. 5
4.10.47. $-1/2$
4.10.48. does not exist
4.10.49. $\infty$
4.10.50. $y = 1$ and $y = -1$
4.11.2. $\infty$, $\infty$, 1, 0
5.1.1. min at $x = 1/2$
5.1.2. min at $x = -1$, max at $x = 1$
5.1.3. max at $x = 2$, min at $x = 4$
5.1.4. min at $x = \pm 1$, max at $x = 0$.
5.1.5. min at $x = 1$
5.1.6. none
5.1.7. none
5.1.8. min at $x = 7\pi/12 + k\pi$, max at $x = -\pi/12 + k\pi$, for integer $k$.
5.1.9. none
5.1.10. local max at $x = 5$
5.1.11. local min at $x = 49$
5.1.12. local min at $x = 0$
5.1.13. Local min of 1 at every point of $[0, 1]$, local max of 1 at every point of $(0, 1)$.
5.1.16. one
5.2.1. min at $x = 1/2$
5.2.2. min at $x = -1$, max at $x = 1$
5.2.3. max at $x = 2$, min at $x = 4$
5.2.4. min at $x = \pm 1$, max at $x = 0$.
5.2.5. min at $x = 1$
5.2.6. none
5.2.7. none
5.2.8. min at $x = 7\pi/12 + k\pi$, max at $x = -\pi/12 + k\pi$, for integer $k$.
5.2.9. none
5.2.10. max at $x = 0$, min at $x = \pm 11$
5.2.11. min at $x = -3/2$, neither at $x = 0$
5.2.12. min at $n\pi$, max at $\pi/2 + n\pi$
5.2.13. min at $2n\pi$, max at $(2n + 1)\pi$
5.2.14. min at $\pi/2 + 2n\pi$, max at $3\pi/2 + 2n\pi$
5.2.15. min at $x = 1/2$
5.3.1. min at $x = -1$, max at $x = 1$
5.3.2. max at $x = 2$, min at $x = 4$
5.3.3. min at $x = \pm 1$, max at $x = 0$.
5.3.4. min at $x = 1$
5.3.5. none
5.3.6. none
5.3.7. none
5.3.8. min at $x = 7\pi/12 + n\pi$, max at $x = -\pi/12 + n\pi$, for integer $n$.
5.3.9. max at $x = 63/64$
5.3.10. max at $x = 7$
5.3.11. max at $5^{-1/4}$, min at $5^{-1/4}$
5.3.12. none
5.3.13. max at $-1$, min at 1
5.3.14. min at $2^{-1/3}$
5.3.15. none
5.3.16. min at $n\pi$
5.3.17. max at $n\pi$, min at $\pi/2 + n\pi$
5.3.18. max at $\pi/2 + 2n\pi$, min at $3\pi/2 + 2n\pi$
5.4.1. concave up everywhere
5.4.2. concave up when $x < 0$, concave down when $x > 0$
5.4.3. concave down when $x < 3$, concave up when $x > 3$
5.4.4. concave up when $x < -1/\sqrt{3}$ or $x > 1/\sqrt{3}$, concave down when $-1/\sqrt{3} < x < 1/\sqrt{3}$
5.4.5. concave up when $x < 0$ or $x > 2/3$, concave down when $0 < x < 2/3$
5.4.6. concave up when $x < 0$, concave down when $x > 0$
5.4.7. concave up when $x < -1$ or $x > 1$, concave down when $-1 < x < 0$ or $0 < x < 1$
5.4.8. concave down on $((8n-1)\pi/4, (8n+3)\pi/4)$, concave up on $(5\pi/4, (8n+7)\pi/4)$, for integer $n$
5.4.9. concave down everywhere
5.4.10. concave up on $(-\infty, (21-\sqrt{497})/4)$ and $(21+\sqrt{497})/4, \infty)$
5.4.11. concave up on $(0, \infty)$
5.4.12. concave down on $(2n\pi/3, (2n+1)\pi/3)$
5.4.13. concave up on $(0, \infty)$
5.4.14. concave up on $(-\infty, -1)$ and $(0, \infty)$
5.4.15. concave down everywhere
5.4.16. concave up everywhere
5.4.17. concave up on $(\pi/4 + n\pi, 3\pi/4 + n\pi)$
5.4.18. inflection points at $n\pi$,
$\pm \arcsin(\sqrt{2/3}) + n\pi$
5.4.19. up/incr: \((3, \infty)\), up/decr: \((-\infty, 0)\), 
\((2, 3)\), down/decr: \((0, 2)\)

6.1.1. max at \((2, 5)\), min at \((0, 1)\)

6.1.2. \(25 \times 25\)

6.1.3. \(P/4 \times P/4\)

6.1.4. \(w = l = 2 \cdot 5^{2/3}, h = 5^{2/3}, h/w = 1/2\)

6.1.5. \(\sqrt[3]{100} \times \sqrt[3]{100} \times 2 \sqrt[3]{100}, h/s = 2\)

6.1.6. \(w = l = 2^{1/3}V^{1/3}, h = V^{1/3} / 2^{2/3}, h/w = 1/2\)

6.1.7. 1250 square feet

6.1.8. \(l^2 / 8\) square feet

6.1.9. \$5000

6.1.10. 100

6.1.11. \(r^2\)

6.1.12. \(h/r = 2\)

6.1.13. \(h/r = 2\)

6.1.14. \(r = 5 \text{ cm}, h = 40/\pi \text{ cm}, h/r = 8/\pi\)

6.1.15. \(8/\pi\)

6.1.16. \(4/27\)

6.1.17. Go direct from \(A\) to \(D\).

6.1.18. (a) 2, (b) 7/2

6.1.19. \(\frac{\sqrt{3}}{6} \times \frac{\sqrt{3}}{6} + \frac{1}{4} \times \frac{1}{4} - \frac{\sqrt{3}}{12}\)

6.1.20. (a) \(a/6\), (b) \((a + b - \sqrt{a^2 - ab + b^2})/6\)

6.1.21. 1.5 meters wide by 1.25 meters tall

6.1.22. If \(k \leq 2/\pi\) the ratio is \((2 - k\pi)/4\); if \(k \geq 2/\pi\), the ratio is zero: the window should be semicircular with no rectangular part.

6.1.23. \(a/b\)

6.1.24. \(w = 2r/\sqrt{3}, h = 2\sqrt{2}r/\sqrt{3}\)

6.1.25. \(1/\sqrt{3} \approx 58\%\)

6.1.26. \(18 \times 18 \times 36\)

6.1.27. \(r = 5/(2\pi)^{1/3} \approx 2.7 \text{ cm}, h = 5 \cdot 2^{5/3}/\pi^{1/3} = 4r \approx 10.8 \text{ cm}\)

6.1.28. \(h = \frac{750}{\pi} \left(\frac{2\pi^2}{750^2}\right)^{1/3}, r = \left(\frac{750^2}{2\pi^2}\right)^{1/6}\)

6.1.29. \(h/r = \sqrt{2}\)

6.1.30. The ratio of the volume of the sphere to the volume of the cone is \(1033/4096 + 33/4096\sqrt{17} \approx 0.2854\), so the cone occupies approximately 28.54% of the sphere.

6.1.31. \(P\) should be at distance \(c\sqrt[3]{a}/(\sqrt[3]{a} + \sqrt[3]{b})\) from charge \(A\).

6.1.32. \(1/2\)

6.1.33. \$7000

6.1.34. There is a critical point when \(\sin \theta_1/v_1 = \sin \theta_2/v_2\), and the second derivative is positive, so there is a minimum at the critical point.

6.2.1. \(1/(16\pi)\) cm/s

6.2.2. \(3/(1000\pi)\) meters/second

6.2.3. \(1/4\) m/s

6.2.4. \(6/25\) m/s

6.2.5. \(80\pi\) mi/min

6.2.6. \(3\sqrt{5}\) ft/s

6.2.7. \(20/(3\pi)\) cm/s

6.2.8. \(13/20\) ft/s

6.2.9. \(5\sqrt{10}/2\) m/s

6.2.10. \(75/64\) m/min
6.2.11. \(145\pi/72 \text{ m/s}\)
6.2.12. \(25\pi/144 \text{ m/min}\)
6.2.13. \(\pi\sqrt{2}/36 \text{ ft/s}\)
6.2.14. tip: 6 ft/s, length: 5/2 ft/s
6.2.15. tip: 20/11 m/s, length: 9/11 m/s
6.2.16. \(380/\sqrt{3} - 150 \approx 69.4 \text{ mph}\)
6.2.17. \(500/\sqrt{3} - 200 \approx 88.7 \text{ km/hr}\)
6.2.18. 18 m/s
6.2.19. \(136\sqrt{475}/19 \approx 156 \text{ km/hr}\)
6.2.20. -50 m/s
6.2.21. 68 m/s
6.2.22. \(3800/\sqrt{329} \approx 210 \text{ km/hr}\)
6.2.23. \(820/\sqrt{329} + 150\sqrt{57}/\sqrt{47} \approx 210 \text{ km/hr}\)
6.2.24. 4000/49 m/s
6.2.25. (a) \(x = a\cos\theta - a\sin\theta\cot(\theta + \beta)\)
6.3.1. \(x_3 = 1.475773162\)
6.3.2. 2.15
6.3.3. 3.36
6.3.4. 2.19 or 1.26
6.4.1. \(\Delta y = 65/16, dy = 2\)
6.4.2. \(\Delta y = \sqrt{11}/10 - 1, dy = 0.05\)
6.4.3. \(\Delta y = \sin(\pi/50), dy = \pi/50\)
6.4.4. \(dV = 8\pi/25\)
6.5.1. \(c = 1/2\)
6.5.2. \(c = \sqrt{18} - 2\)
6.5.6. \(x^3/3 + 47x^2/2 - 5x + k\)
6.5.7. \(\arctan x + k\)
6.5.8. \(x^4/4 - \ln x + k\)
6.5.9. \(-\cos(2x)/2 + k\)
7.1.1. 10
7.1.2. 35/3
7.1.3. \(x^2\)
7.1.4. \(2x^2\)
7.1.5. \(2x^2 - 8\)
7.1.6. \(2b^2 - 2a^2\)
7.1.7. 4 rectangles: \(41/4 = 10.25,\)
8 rectangles: \(183/16 = 11.4375\)
7.1.8. 23/4
7.2.1. \((16/3)x^{3/2} + C\)
7.2.2. \(t^3 + t + C\)
7.2.3. \(8\sqrt{x} + C\)
7.2.4. \(-2/z + C\)
7.2.5. \(7\ln z + C\)
7.2.6. \((5x + 1)^3/15 + C\)
7.2.7. \((x - 6)^3/3 + C\)
7.2.8. \(2x^{5/2}/5 + C\)
7.2.9. \(-4/\sqrt{x} + C\)
7.2.10. \(4t - t^2 + C, t < 2; t^2 - 4t + 8 + C, t \geq 2\)
7.2.11. 87/2
7.2.12. 2
7.2.13. \(\ln(10)\)
7.2.14. \(e^5 - 1\)
7.2.15. \(3^4/4\)
7.2.16. \(2^6/6 - 1/6\)
7.2.17. \(x^2 - 3x\)
7.2.18. \(2x(x^4 - 3x^2)\)
7.2.19. \(e^{x^2}\)
7.2.20. \(2xe^{x^4}\)
7.2.21. \(\tan(x^2)\)
7.2.22. \(2x \tan(x^4)\)
7.3.1. It rises until \( t = 100/49 \), then falls. The position of the object at time \( t \) is \( s(t) = -4.9t^2 + 20t + k \). The net distance traveled is \(-45/2\), that is, it ends up 45/2 meters below where it started. The total distance traveled is 6205/98 meters.

7.3.2. \( \int_{0}^{2\pi} \sin t \, dt = 0 \)

7.3.3. net: \( 2\pi \), total: \( 2\pi/3 + 4\sqrt{3} \)

7.3.4. 8

7.3.5. 17/3

7.3.6. \( A = 18, B = 44/3, C = 10/3 \)

8.1.1. \(-(1-t)^{10}/10 + C \)

8.1.2. \( x^5/5 + 2x^3/3 + x + C \)

8.1.3. \((x^2 + 1)^{101}/202 + C \)

8.1.4. \(-3(1-5t)^2/3 + C \)

8.1.5. \((\sin^4 x)/4 + C \)

8.1.6. \(- (100 - x^2)^{3/2}/3 + C \)

8.1.7. \(-2\sqrt{1 - x^3}/3 + C \)

8.1.8. \( \sin(\sin \pi t)/\pi + C \)

8.1.9. \( 1/(2 \cos^2 x) = (1/2) \sec^2 x + C \)

8.1.10. \(- \ln |\cos x| + C \)

8.1.11. 0

8.1.12. \( \tan^2 x)/2 + C \)

8.1.13. 1/4

8.1.14. \(- \cos(\tan x) + C \)

8.1.15. 1/10

8.1.16. \( \sqrt{3}/4 \)

8.1.17. \((27/8)(x^2 - 7)^8/9 + C \)

8.1.18. \(-(3^7 + 1)/14 \)

8.1.19. 0

8.1.20. \( f(x)^2/2 \)

8.2.1. \( x/2 - \sin(2x)/4 + C \)

8.2.2. \( - \cos x + (\cos^3 x)/3 + C \)

8.2.3. \( 3x/8 - (\sin 2x)/4 + (\sin 4x)/32 + C \)

8.2.4. \( (\cos^5 x)/5 - (\cos^3 x)/3 + C \)

8.2.5. \( \sin x - (\sin^3 x)/3 + C \)

8.2.6. \( x/8 - (\sin 4x)/32 + C \)

8.2.7. \( (\sin^3 x)/3 - (\sin^5 x)/5 + C \)

8.2.8. \(-2(\cos x)^{5/2}/5 + C \)

8.2.9. \( \tan x - \cot x + C \)

8.2.10. \( (\sec^3 x)/3 - \sec x + C \)

8.3.1. \( - \ln |\csc x + \cot x| + C \)

8.3.2. \(- \csc x \cot x/2 - (1/2) \ln |\csc x + \cot x| + C \)

8.3.3. \( x \sqrt{x^2 - 1/2} - \ln |x + \sqrt{x^2 - 1}/2| + C \)

8.3.4. \( x \sqrt{9 + 4x^2/2 + (9/4) \ln |2x + \sqrt{9 + 4x^2}|} + C \)

8.3.5. \(- (1 - x^2)^{3/2}/3 + C \)

8.3.6. \( \arcsin(x)/8 - \sin(4 \arcsin x)/32 + C \)

8.3.7. \( \ln |x + \sqrt{1 + x^2}| + C \)

8.3.8. \( (x + 1) \sqrt{x^2 + 2x}/2 - \ln |x + 1 + \sqrt{x^2 + 2x}| + 1/2 + C \)

8.3.9. \(- \arctan x - 1/x + C \)

8.3.10. \( 2 \arcsin(x/2) - x \sqrt{4 - x^2}/2 + C \)

8.3.11. \( \arcsin(\sqrt{x}) - \sqrt{x} \sqrt{1 - x} + C \)

8.3.12. \( (2x^2 + 1) \sqrt{4x^2 - 1}/24 + C \)

8.4.1. \( \cos x + x \sin x + C \)

8.4.2. \( x^2 \sin x - 2 \sin x + 2x \cos x + C \)

8.4.3. \( (x - 1)e^x + C \)

8.4.4. \( (1/2)e^{x^2} + C \)

8.4.5. \( (x/2) - \sin(2x)/4 + C = (x/2) - (\sin x \cos x)/2 + C \)
8.4.6. \( x \ln x - x + C \)
8.4.7. \( (x^2 \arctan x + \arctan x - x)/2 + C \)
8.4.8. \(-x^3 \cos x + 3x^2 \sin x + 6x \cos x - 6 \sin x + C \)
8.4.9. \( x^3 \sin x + 3x^2 \cos x - 6x \sin x - 6 \cos x + C \)
8.4.10. \( x^2/4 - (\cos^2 x)/4 - (x \sin x \cos x)/2 + C \)
8.4.11. \( x/4 - (x \cos^2 x)/2 + (\cos x \sin x)/4 + C \)
8.4.12. \( x \arctan(\sqrt{x}) + \arctan(\sqrt{x}) - \sqrt{x} + C \)
8.4.13. \( 2 \sin(\sqrt{x}) - 2 \sqrt{x} \cos(\sqrt{x}) + C \)
8.4.14. \( \sec x \csc x - 2 \cot x + C \)
8.5.1. \(-\ln |x - 2|/4 + \ln |x + 2|/4 + C \)
8.5.2. \(-x^3/3 - 4x - 4 \ln |x - 2| + 4 \ln |x + 2| + C \)
8.5.3. \(-1/(x + 5) + C \)
8.5.4. \(-x - \ln |x - 2| + \ln |x + 2| + C \)
8.5.5. \(-4x + x^3/3 + 8 \arctan(x/2) + C \)
8.5.6. \((1/2) \arctan(x/2 + 1/2) + C \)
8.5.7. \(x^2/2 - 2 \ln(4 + x^2) + C \)
8.5.8. \((1/4) \ln |x + 3| - (1/4) \ln |x + 7| + C \)
8.5.9. \((1/5) \ln |2x - 3| - (1/5) \ln |1 + x| + C \)
8.5.10. \((1/3) \ln |x| - (1/3) \ln |x + 3| + C \)
8.6.1. \(T, S: 4 \pm 0 \)
8.6.2. \(T: 9.28125 \pm 0.281125; S: 9 \pm 0 \)
8.6.3. \(T: 60.75 \pm 1; S: 60 \pm 0 \)
8.6.4. \(T: 1.1167 \pm 0.0833; S: 1.1000 \pm 0.0167 \)
8.6.5. \(T: 0.3235 \pm 0.0026; S: 0.3217 \pm 0.000065 \)
8.6.6. \(T: 0.6478 \pm 0.0052; S: 0.6438 \pm 0.000033 \)
8.6.7. \(T: 2.8833 \pm 0.0834; S: 2.9000 \pm 0.0167 \)
8.6.8. \(T: 1.1170 \pm 0.0077; S: 1.1114 \pm 0.0002 \)
8.6.9. \(T: 1.097 \pm 0.0147; S: 1.089 \pm 0.0003 \)
8.6.10. \(T: 3.63 \pm 0.087; S: 3.62 \pm 0.032 \)
8.7.1. \(\frac{(t + 4)^4}{4} + C \)
8.7.2. \(\frac{(t^2 - 9)^{5/2}}{5} + C \)
8.7.3. \(\frac{(e^t + 16)^2}{4} + C \)
8.7.4. \(\cos t - \frac{2}{3} \cos^3 t + C \)
8.7.5. \(\frac{\tan^2 t}{2} + C \)
8.7.6. \(\ln |t^2 + t + 3| + C \)
8.7.7. \(\frac{1}{8} \ln |1 - 4/t^2| + C \)
8.7.8. \(\frac{1}{25} \tan(\arcsin(t/5)) + C = \frac{t}{25\sqrt{25 - t^2}} + C \)
8.7.9. \(\frac{2}{3} \sqrt{\sin^3 t} + C \)
8.7.10. \(t \tan t + \ln |\cos t| + C \)
8.7.11. \(2\sqrt{e^t + 1} + C \)
8.7.12. \(\frac{3t}{8} + \frac{\sin 2t}{4} + \frac{\sin 4t}{32} + C \)
8.7.13. \(\ln |t| - \frac{\ln |t + 3|}{3} + C \)
8.7.14. \(-\frac{1}{\sin \arctan t} + C = -\sqrt{1 + t^2}/t + C \)
8.7.15. \(-\frac{1}{2(1 + \tan t)^2} + C \)
8.7.16. \(\frac{(t^2 + 1)^{5/2}}{5} - \frac{(t^2 + 1)^{3/2}}{3} + C \)
8.7.17. \(e^t \sin t - e^t \cos t + C \)
8.7.18. \(\frac{(t^{3/2} + 47)^4}{6} + C \)
306  Appendix A Selected Answers

8.7.19. \[ \frac{2}{3(2 - t^2)^{3/2}} - \frac{1}{(2 - t^2)^{1/2}} + C \]

8.7.20. \[ \frac{\ln|\sin(\arctan(2t/3))|}{9} + C = \frac{\ln(4t^2) - \ln(9 + 4t^2)}{18} + C \]

8.7.21. \[ \frac{(\arctan(2t))^2}{4} + C \]

8.7.22. \[ \frac{3 \ln|t + 3|}{4} + \frac{\ln|t - 1|}{4} + C \]

8.7.23. \[ \frac{\cos^7 t}{7} - \frac{\cos^5 t}{5} + C \]

8.7.24. \[ \frac{-1}{t - 3} + C \]

8.7.25. \[ \frac{-1}{\ln t} + C \]

8.7.26. \[ \frac{t^2(\ln t)^2}{2} - \frac{t^2 \ln t}{2} + \frac{t^2}{4} + C \]

8.7.27. \[ (t^3 - 3t^2 + 6t - 6)e^t + C \]

8.7.28. \[ \frac{5 + \sqrt{5}}{10} \ln(2t + 1 - \sqrt{5}) + \frac{5 - \sqrt{5}}{10} \ln(2t + 1 + \sqrt{5}) + C \]

9.1.1. \[ 8\sqrt{2}/15 \]

9.1.2. \[ 1/12 \]

9.1.3. \[ 9/2 \]

9.1.4. \[ 4/3 \]

9.1.5. \[ 2/3 - 2/\pi \]

9.1.6. \[ 3/\pi - 3\sqrt{3}/(2\pi) - 1/8 \]

9.1.7. \[ 1/3 \]

9.1.8. \[ 10\sqrt{5}/3 - 6 \]

9.1.9. \[ 500/3 \]

9.1.10. \[ 2 \]

9.1.11. \[ 1/5 \]

9.1.12. \[ 1/6 \]

9.2.1. \[ 1/\pi, 5/\pi \]

9.2.2. \[ 0, 245 \]

9.2.3. \[ 20, 28 \]

9.2.4. \[ (3 - \pi)/(2\pi), (18 - 12\sqrt{3} + \pi)/(4\pi) \]

9.2.5. \[ 10/49 \text{ meters, } 20/49 \text{ seconds} \]

9.2.6. \[ 45/98 \text{ meters, } 30/49 \text{ seconds} \]

9.2.7. \[ 25000/49 \text{ meters, } 1000/49 \text{ seconds} \]

9.2.8. \[ s(t) = \cos t, v(t) = -\sin t, \]

maximum distance is 1,
maximum speed is 1

9.2.9. \[ s(t) = -\sin(\pi t)/\pi^2 + t/\pi, \]

\[ v(t) = -\cos(\pi t)/\pi + 1/\pi, \]

maximum speed is 2/\pi

9.2.10. \[ s(t) = t^2/2 - \sin(\pi t)/\pi^2 + t/\pi, \]

\[ v(t) = t - \cos(\pi t)/\pi + 1/\pi \]

9.2.11. \[ s(t) = t^2/2 + \sin(\pi t)/\pi^2 - t/\pi, \]

\[ v(t) = t + \cos(\pi t)/\pi - 1/\pi \]

9.3.5. \[ 8\pi/3 \]

9.3.6. \[ \pi/30 \]

9.3.7. \[ \pi(\pi/2 - 1) \]

9.3.8. \[ (a) 114\pi/5 (b) 74\pi/5 (c) 20\pi \]

\[ (d) 4\pi \]

9.3.9. \[ 16\pi, 24\pi \]

9.3.11. \[ \pi h^2(3r - h)/3 \]

9.3.13. \[ 2\pi \]

9.4.1. \[ 2/\pi; 2/\pi; 0 \]

9.4.2. \[ 4/3 \]

9.4.3. \[ 1/A \]

9.4.4. \[ \pi/4 \]

9.4.5. \[ -1/3, 1 \]

9.4.6. \[ -4\sqrt{1224} \text{ ft/s; } -8\sqrt{1224} \text{ ft/s} \]

9.5.1. \[ \approx 5, 305, 028, 516 \text{ N-m} \]

9.5.2. \[ \approx 4, 457, 854, 041 \text{ N-m} \]

9.5.3. \[ 367, 500\pi \text{ N-m} \]
9.5.4. $49000\pi + 196000/3$ N-m
9.5.5. $2450\pi$ N-m
9.5.6. $0.05$ N-m
9.5.7. $6/5$ N-m
9.5.8. $3920$ N-m
9.5.9. $23520$ N-m
9.5.10. $12740$ N-m
9.6.1. $15/2$
9.6.2. $5$
9.6.3. $16/5$
9.6.5. $\bar{x} = 45/28, \bar{y} = 93/70$
9.6.6. $\bar{x} = 0, \bar{y} = 4/(3\pi)$
9.6.7. $\bar{x} = 1/2, \bar{y} = 2/5$
9.6.8. $\bar{x} = 0, \bar{y} = 8/5$
9.6.9. $\bar{x} = 4/7, \bar{y} = 2/5$
9.6.10. $\bar{x} = \bar{y} = 1/5$
9.6.11. $\bar{x} = 0, \bar{y} = 28/(9\pi)$
9.6.12. $\bar{x} = \bar{y} = 28/(9\pi)$
9.6.13. $\bar{x} = 0, \bar{y} = 244/(27\pi) \approx 2.88$
9.7.1. $\infty$
9.7.2. $1/2$
9.7.3. diverges
9.7.4. diverges
9.7.5. $1$
9.7.6. diverges
9.7.7. $2$
9.7.8. diverges
9.7.9. $\pi/6$
9.7.10. diverges, $0$
9.7.11. diverges, $0$
9.7.12. diverges, no CPV
9.7.13. $\pi$
9.7.14. $80$ mph: $90.8$ to $95.3$ N-m
90 mph: $114.9$ to $120.6$ N-m
100.9 mph: $144.5$ to $151.6$ N-m
9.8.2. $\mu = 1/c, \sigma = 1/c$
9.8.3. $\mu = (a + b)/2, \sigma = (b - a)/2\sqrt{3}$
9.8.4. $7/2$
9.8.5. $21/2$
9.8.9. $r = 6$
9.9.1. $(22\sqrt{22} - 8)/27$
9.9.2. $\ln(2) + 3/8$
9.9.3. $a + a^3/3$
9.9.4. $\ln((\sqrt{2} + 1)/\sqrt{3})$
9.9.6. $3/4$
9.9.7. $\approx 3.82$
9.9.8. $\approx 1.01$
9.9.9. $\sqrt{1 + e^2} - \sqrt{2} + 1 - \ln(\sqrt{1 + e^2} + 1) + \ln(\sqrt{2} + 1)$
9.10.1. $8\pi\sqrt{3} - \frac{16\pi\sqrt{2}}{3}$
9.10.3. $\frac{730\pi\sqrt{730}}{27} - \frac{10\pi\sqrt{10}}{27}$
9.10.4. $\pi + 2\pi e + \frac{1}{4\pi e^2} - \frac{\pi}{4e^2} - \frac{2\pi}{e}$
9.10.6. $8\pi^2$
9.10.7. $2\pi + \frac{8\pi^2}{3\sqrt{3}}$
9.10.8. $a > b$: $2\pi b^2 + \frac{2\pi a^2 b}{\sqrt{a^2 - b^2}} \arcsin(\sqrt{a^2 - b^2}/a)$,
$a < b$: $2\pi b^2 + \frac{2\pi a^2 b}{\sqrt{b^2 - a^2}} \ln\left(\frac{b + \sqrt{b^2 - a^2}}{a}\right)$
10.1.2. $\theta = \arctan(3)$
10.1.11. \( r = -4 \csc \theta \)

10.1.14. \( r^3 \cos \theta \sin^2 \theta = 1 \)

10.1.5. \( r = \sqrt{5} \)

10.1.6. \( r^2 = \sin \theta \sec^3 \theta \)

10.1.7. \( r \sin \theta = \sin(r \cos \theta) \)

10.1.8. \( r = 2/(\sin \theta - 5 \cos \theta) \)

10.1.9. \( r = 2 \sec \theta \)

10.1.10. \( 0 = r^2 \cos^2 \theta - r \sin \theta + 1 \)

10.1.11. \( 0 = 3r^2 \cos^2 \theta - 2r \cos \theta - r \sin \theta \)

10.1.12. \( r = \sin \theta \)

10.1.21. \( (x^2 + y^2)^2 = 4x^2y - (x^2 + y^2)y \)

10.1.22. \( (x^2 + y^2)^{3/2} = y^2 \)

10.1.23. \( x^2 + y^2 = x^2y^2 \)

10.1.24. \( x^4 + x^2y^2 = y^2 \)

10.2.1. \( (\theta \cos \theta + \sin \theta) / (-\sin \theta + \cos \theta), (\theta^2 + 2) / (-\sin \theta + \cos \theta)^3 \)

10.2.2. \( \frac{\cos \theta + 2 \sin \theta \cos \theta}{\cos^2 \theta - \sin^2 \theta - \sin \theta}, \frac{\cos^2 \theta - \sin^2 \theta - \sin \theta}{3(1 + \sin \theta)} \)

10.2.3. \( (\sin^2 \theta - \cos^2 \theta) / (2 \sin \theta \cos \theta), -1 / (4 \sin^3 \theta \cos^3 \theta) \)

10.2.4. \( \frac{2 \sin \theta \cos \theta}{\cos^2 \theta - \sin^2 \theta}, \frac{2}{(\cos^2 \theta - \sin^2 \theta)^3} \)

10.2.5. undefined

10.2.6. \( \frac{2 \sin \theta - 3 \sin^3 \theta}{3 \cos^3 \theta - 2 \cos \theta}, \frac{3 \cos^4 \theta - 3 \cos^2 \theta + 2}{2 \cos^3 \theta(3 \cos^2 \theta - 2)^3} \)

10.3.1. 1

10.3.2. \( 9\pi/2 \)

10.3.3. \( \sqrt{3}/3 \)

10.3.4. \( \pi/12 + \sqrt{3}/16 \)

10.3.5. \( \pi a^2 \)

10.3.6. \( 41\pi/2 \)

10.3.7. \( 2 - \pi/2 \)

10.3.8. \( \pi/12 \)

10.3.9. \( 3\pi/16 \)

10.3.10. \( \pi/4 - 3\sqrt{3}/8 \)

10.3.11. \( \pi/2 + 3\sqrt{3}/8 \)

10.3.12. 1/2

10.3.13. \( 3/2 - \pi/4 \)

10.3.14. \( \pi/3 + \sqrt{3}/2 \)

10.3.15. \( \pi/3 - \sqrt{3}/4 \)

10.3.16. \( 4\pi^3/3 \)

10.3.17. \( \pi^2 \)

10.3.18. \( 5\pi/24 - \sqrt{3}/4 \)

10.3.19. \( 7\pi/12 - \sqrt{3} \)

10.3.20. \( 4\pi - \sqrt{15}/2 - 7 \arccos(1/4) \)

10.3.21. \( 3\pi^3 \)

10.4.6. \( x = t - \frac{\sin(t)}{2}, y = 1 - \frac{\cos(t)}{2} \)

10.4.7. \( x = 4 \cos t - \cos(4t), y = 4 \sin t - \sin(4t) \)

10.4.8. \( x = 2 \cos t + \cos(2t), y = 2 \sin t - \sin(2t) \)

10.4.9. \( x = \cos t + t \sin t, y = \sin t - t \cos t \)

10.5.1. There is a horizontal tangent at all multiples of \( \pi \).

10.5.2. \( 9\pi/4 \)

10.5.3. \( \int_0^{2\pi} \frac{1}{2} \sqrt{5 - 4 \cos t} \, dt \)

10.5.4. Four points:

\[ \left( \frac{-3 - 3\sqrt{5}}{4}, \pm 5 \sqrt{5 - \sqrt{5}} - 8 \right), \]

\[ \left( \frac{-3 + 3\sqrt{5}}{4}, \pm 5 \sqrt{5 + \sqrt{5}} - 8 \right) \]
10.5.5.  $11\pi/3$
10.5.6.  $32/3$
10.5.7.  $2\pi$
10.5.8.  $16/3$
10.5.9.  $(\pi/2, 1)$
10.5.10.  $5\pi^3/6$
10.5.11.  $2\pi^2$
10.5.12.  $(2\pi \sqrt{4\pi^2 + 1} + \ln(2\pi + \sqrt{4\pi^2 + 1}))/2$

11.1.1.  1
11.1.3.  0
11.1.4.  1
11.1.5.  1
11.1.6.  0
11.2.1.  $\lim_{n \to \infty} n^2/(2n^2 + 1) = 1/2$
11.2.2.  $\lim_{n \to \infty} 5/(2^{1/n} + 14) = 1/3$
11.2.3.  $\sum_{n=1}^{\infty} \frac{1}{n}$ diverges, so $\sum_{n=1}^{\infty} 3\frac{1}{n}$ diverges
11.2.4.  $-3/2$
11.2.5.  11
11.2.6.  20
11.2.7.  3/4
11.2.8.  3/2
11.2.9.  3/10
11.3.1.  diverges
11.3.2.  diverges
11.3.3.  converges
11.3.4.  converges
11.3.5.  converges
11.3.6.  converges
11.3.7.  diverges
11.3.8.  converges
11.3.9.  $N = 5$
11.3.10.  $N = 10$
11.3.11.  $N = 1687$
11.3.12.  any integer greater than $e^{200}$
11.4.1.  converges
11.4.2.  converges
11.4.3.  diverges
11.4.4.  converges
11.4.5.  0.90
11.4.6.  0.95
11.5.1.  converges
11.5.2.  converges
11.5.3.  converges
11.5.4.  diverges
11.5.5.  diverges
11.5.6.  diverges
11.5.7.  converges
11.5.8.  diverges
11.5.9.  converges
11.5.10.  diverges
11.6.1.  converges absolutely
11.6.2.  diverges
11.6.3.  converges conditionally
11.6.4.  converges absolutely
11.6.5.  converges conditionally
11.6.6.  converges absolutely
11.6.7.  diverges
11.6.8.  converges conditionally
11.7.5.  converges
11.7.6.  converges
11.7.7. converges
11.7.8. diverges
11.8.1. $R = 1, I = (-1, 1)$
11.8.2. $R = \infty, I = (-\infty, \infty)$
11.8.3. $R = e, I = (-e, e)$
11.8.4. $R = e, I = (2 - e, 2 + e)$
11.8.5. $R = 0$, converges only when $x = 2$
11.8.6. $R = 1, I = [-6, -4]$
11.8.1. the alternating harmonic series
11.9.2. $\sum_{n=0}^{\infty} (n+1)x^n$
11.9.3. $\sum_{n=0}^{\infty} (n+1)(n+2)x^n$
11.9.4. $\sum_{n=0}^{\infty} \frac{(n+1)(n+2)}{2} x^n, R = 1$
11.9.5. $C + \sum_{n=0}^{\infty} \frac{-1}{(n+1)(n+2)} x^{n+2}$
11.10.1. $\sum_{n=0}^{\infty} (-1)^n x^{2n}/(2n)!$, $R = \infty$
11.10.2. $\sum_{n=0}^{\infty} x^n/n!, R = \infty$
11.10.3. $\sum_{n=0}^{\infty} (-1)^n \frac{(x-5)^n}{5^{n+1}}, R = 5$
11.10.4. $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{(x-1)^n}{n}, R = 1$
11.10.5. $\ln(2) + \sum_{n=1}^{\infty} (-1)^{n-1} \frac{(x-2)^n}{n 2^n}, R = 2$
11.10.6. $\sum_{n=0}^{\infty} (-1)^n (n+1)(x-1)^n, R = 1$
11.10.7. $1 + \sum_{n=1}^{\infty} \frac{1 \cdot 3 \cdot 5 \cdots (2n-1)}{n! 2^n} x^n = 1 + \sum_{n=1}^{\infty} \frac{(2n-1)!}{2^{2n-1}(n-1)! n!} x^n, R = 1$
11.10.8. $x + x^3/3$
11.10.9. $\sum_{n=0}^{\infty} (-1)^n x^{4n+1}/(2n)!$
11.10.10. $\sum_{n=0}^{\infty} (-1)^n x^{n+1}/n!$
11.11.1. $1 - \frac{x^2}{2} + \frac{x^4}{24} - \frac{x^6}{720} + \cdots + \frac{x^{12}}{12!}$
11.11.2. 1000; 8
11.11.3. $x + \frac{x^3}{3} + \frac{2x^5}{15}$, error $\pm 1.32$.
11.12.1. diverges
11.12.2. converges
11.12.3. converges
11.12.4. diverges
11.12.5. diverges
11.12.6. diverges
11.12.7. converges
11.12.8. converges
11.12.9. converges
11.12.10. converges
11.12.11. converges
11.12.12. converges
11.12.13. converges
11.12.14. converges
11.12.15. converges
11.12.16. converges
11.12.17. diverges
11.12.18. $(-\infty, \infty)$
11.12.19. $(-3, 3)$
11.12.20. $(-3, 3)$
11.12.21. $(-1, 1)$
11.12.22. radius is 0—it converges only when
\[ x = 0 \]

11.12.23. \((-\sqrt{3}, \sqrt{3})\)

11.12.24. \((-\infty, \infty)\)

11.12.25. \[ \sum_{n=0}^{\infty} \frac{(\ln(2))^n}{n!} x^n \]

11.12.26. \[ \sum_{n=0}^{\infty} \frac{(-1)^n}{n+1} x^{n+1} \]

11.12.27. \[ \sum_{n=0}^{\infty} \frac{2}{2n+1} x^{2n+1} \]

11.12.28. \[ 1 + \frac{x}{2} + \sum_{n=2}^{\infty} (-1)^{n+1} \frac{1 \cdot 3 \cdot 5 \cdots (2n-3)}{2^n n!} x^n \]

11.12.29. \[ \sum_{n=0}^{\infty} (-1)^n x^{2n} \]

11.12.30. \[ \sum_{n=0}^{\infty} \frac{(-1)^n}{2n+1} x^{2n+1} \]

11.12.31. \[ \pi = \sum_{n=0}^{\infty} (-1)^n \frac{4}{2n+1} \]