

- (b) 1.1418 25. 3,166,250¢, or \$31,662.50 27. 247.68
 29. 124 31. 4 33. 12 35. $\frac{9}{2}$ 37. 25 39. 8
 41. 1.0016 43. 37.96 (Exact area is $\frac{1}{2} \cdot 25\pi$.)

Technology Connection, p. 413

$$1. \frac{32}{3} \quad 2. \frac{9}{4} \quad 3. \frac{5 - \ln 6}{6} \approx 0.535 \quad 4. \sim 1.59359 \\ 5. 313.24$$

Technology Connection, p. 418

1. 0 2. 13.75 3. 0.535 4. 27.972 5. -260

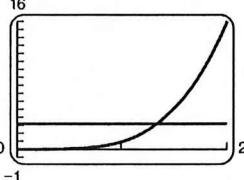
Exercise Set 4.3, p. 421

1. 8 3. 8 5. $41\frac{2}{3}$ 7. $\frac{1}{4}$ 9. $10\frac{2}{3}$ 11. $e^3 - 1 \approx 19.086$
 13. $3 \ln 6 \approx 5.375$ 15. Total cost, in dollars, for t days
 17. Total number of kilowatts used in t hours 19. Total revenue, in dollars, for x units produced 21. Total amount of the drug, in milligrams, in v cubic centimeters of blood 23. Total number of words memorized in t minutes 25. 4 27. $9\frac{5}{6}$ 29. 12
 31. $e^5 - e^{-1}$, or approximately 148.045 33. 35. 0; the area above the x -axis is the same as the area below the x -axis.
 37. 0; the area above the x -axis is the same as the area below it.
 39–42. Left to the student 43. 40 45. $\frac{5}{3}$ 47. $\frac{637}{6}$
 49. $e^2 - e^{-5}$, or approximately 7.382 51. $\frac{b^3 - a^3}{6}$
 53. $\frac{e^{2b} - e^{2a}}{2}$ 55. $\frac{e^2 + 1}{2}$, or approximately 4.195
 57. $\frac{8}{3}$ 59. \$628.56 61. \$29.13 63. (a) \$2948.26;
 (b) \$2913.90 65. \$7627.28 billion 67. 18.69 hr; 20.12 hr
 69. 7 words 71. About 5 words 73. $s(t) = t^3 + 4$
 75. $v(t) = 2t^2 + 20$ 77. $s(t) = -\frac{t^3}{3} + 3t^2 + 6t + 10$
 79. (a) 104.17 m; (b) 229.17 m 81. (a) 60 mph;
 (b) $\frac{1}{8}$ mi 83. (a) 16.67 km/hr; (b) 0.1875 km
 85. $s(t) = -16t^2 + v_0t + s_0$ 87. $\frac{1}{6}$ mi 89. 148 mi
 91. On the 10th day 93. 3.5 95. $359\frac{7}{15}$ 97. 6.75
 99. 30 101. $5\frac{1}{3}$ 103. $14\frac{2}{3}$ 105. 107. 4068.789
 109. 7.571 111. 9.524 113. 10.987

Technology Connection, p. 429

1. $\frac{4}{3}$ 2. Left to the student

Technology Connection, p. 432

1. $f(x) = x^4$ and $y_{av} = 3.2$
- 
- Over the interval $[0, 2]$, the areas under $f(x) = x^4$ and $y_{av} = 3.2$ are equal.

Exercise Set 4.4, p. 433

1. 22 3. $18\frac{1}{6}$ 5. $89\frac{11}{12}$ 7. 5 9. $\frac{7}{2}$ 11. $x = -3$ and $x = 3$
 13. $x = \frac{3 \pm \sqrt{29}}{2}$, or approximately $x = -1.193$ and $x = 4.193$
 15. $x = -3$ and $x = 5$ 17. $\frac{3}{2}$ 19. 62.5 21. $\frac{1}{4}$ 23. $4\frac{1}{2}$
 25. $20\frac{5}{6}$ 27. $4\frac{1}{2}$ 29. $\frac{3}{10}$ 31. $41\frac{2}{3}$ 33. $10\frac{2}{3}$ 35. 3
 37. $85\frac{1}{3}$ 39. $\frac{8}{3}$ 41. $-e^{-1} + 1$, or approximately 0.632
 43. $\frac{16}{3}$ 45. $2a + 5$ 47. $\frac{2^{n+1} - 1}{n + 1}$ 49. (a) \$2,201,556.58;

- (b) \$220,155.66 51. \$26,534.37 53. \$32,781.35
 55. (a) Ben; (b) 2 more words; (c) 0.7 word per minute;
 (d) 0.9 word per minute 57. (a) 90 words per minute;
 (b) 96 words per minute, at $t = 1$ min; (c) 70 words per minute
 59. (a) $42.03 \mu\text{g/mL}$; (b) $22.44 \mu\text{g/mL}$ 61. (a) 31.7° ;
 (b) -10° ; (c) 46.25° 63. $40\frac{8}{15}$ 65. 16 67. 6 69. 4
 71. 4 73. 5.886 75. 0.237

Technology Connection, p. 441

1. 4.673

Exercise Set 4.5, p. 443

1. $\frac{1}{6}(8 + x^3)^6 + C$ 3. $\frac{1}{16}(x^2 - 6)^8 + C$ 5. $\frac{1}{24}(3t^4 + 2)^2 + C$
 7. $\ln(2x + 1) + C$ 9. $\frac{1}{4}(\ln x)^4 + C$ 11. $\frac{1}{3}e^{3x} + C$
 13. $3e^{x/3} + C$ 15. $\frac{1}{5}e^{x^5} + C$ 17. $-\frac{1}{2}e^{-t^2} + C$
 19. $\frac{1}{2}\ln(5 + 2x) + C$ 21. $\frac{1}{3}\ln(12 + 3x) + C$
 23. $-\ln(1 - x) + C$ 25. $\frac{1}{12}(t^2 - 1)^6 + C$
 27. $\frac{1}{8}(x^4 + x^3 + x^2)^8 + C$ 29. $\ln(4 + e^x) + C$
 31. $(\ln x)^2 + C$ 33. $\ln(\ln x) + C$ 35. $\frac{1}{3a}(ax^2 + b)^{3/2} + C$
 37. $\frac{P_0}{k}e^{kt} + C$ 39. $\frac{1}{24(2 - x^4)^6} + C$ 41. $\frac{5}{6}(1 + 6x^2)^{6/5} + C$
 43. $e - 1$ 45. $\frac{21}{4}$ 47. $\ln 5$ 49. $\ln 19$ 51. $1 - e^{-b}$
 53. $1 - e^{-mb}$ 55. $\frac{208}{3}$ 57. $\frac{1640}{6561}$ 59. $\frac{315}{8}$
 61. Left to the student 63. $\frac{3}{2}x - \frac{3}{4}\ln(2x + 1) + C$
 65. $x + 5\ln(x - 2) + C$
 67. $\frac{1}{13}(x + 1)^{13} - \frac{1}{6}(x + 1)^{12} + \frac{1}{11}(x + 1)^{11} + C$
 69. $\frac{2}{7}(x - 2)^{7/2} + \frac{8}{5}(x - 2)^{5/2} + \frac{8}{3}(x - 2)^{3/2} + C$
 71. $D(x) = 2000\sqrt{25 - x^2} + 5000$ 73. $P(x) = \frac{1500}{x^2 - 6x + 10}$
 75. $5\frac{1}{3}$ 77. $\frac{1}{a}\ln(ax + b) + C$ 79. $2e^{\sqrt{t}} + C$
 81. $\frac{1}{100}(\ln x)^{100} + C$ 83. $\frac{1}{2}(e^t + 2)^2 + C$
 85. $\frac{4}{9}(2 + t^3)^{3/4} + C$ 87. $\frac{1}{3}(\ln x)^3 + \frac{3}{2}(\ln x)^2 + 4\ln x + C$
 89. $\frac{1}{8}[\ln(t^4 + 8)]^2 + C$ 91. $x + \frac{9}{x + 3} + C$
 93. $t - 4 - \ln(t - 4) + C$, or $t - \ln(t - 4) + K$, where
 $K = -4 + C$ 95. $-\ln(1 + e)^{-x} + C$ 97. $\frac{(\ln x)^{n+1}}{n + 1} + C$
 99. $\frac{1}{am}\ln(1 - ae^{-mx}) + C$ 101. $\frac{5}{6(n + 1)}(2x^3 - 7)^{n+1} + C$

Technology Connection, p. 449

1. 1.941

Exercise Set 4.6, p. 452

1. $xe^{4x} - \frac{1}{4}e^{4x} + C$ 3. $\frac{x^6}{2} + C$ 5. $\frac{1}{5}xe^{5x} - \frac{1}{25}e^{5x} + C$
 7. $-\frac{1}{2}xe^{-2x} - \frac{1}{4}e^{-2x} + C$ 9. $\frac{x^3 \ln x}{3} - \frac{x^3}{9} + C$
 11. $\frac{1}{4}x^2 \ln x - \frac{1}{8}x^2 + C$ 13. $(x + 5)\ln(x + 5) - x + C$
 15. $\left(\frac{x^2}{2} + 2x\right)\ln x - \frac{x^2}{4} - 2x + C$
 17. $\left(\frac{x^2}{2} - x\right)\ln x - \frac{x^2}{4} + x + C$
 19. $\frac{2}{3}x(x + 2)^{3/2} - \frac{4}{15}(x + 2)^{5/2} + C$
 21. $\frac{x^4}{4}\ln(2x) - \frac{x^4}{16} + C$, or $\frac{x^4 \ln 2}{4} - \frac{x^4 \ln x}{4} + \frac{x^4}{16} + C$
 23. $x^2e^x - 2xe^x + 2e^x + C$ 25. $\frac{1}{2}x^2e^{2x} - \frac{1}{2}xe^{2x} + \frac{1}{4}e^{2x} + C$
 27. $-\frac{1}{2}x^3e^{-2x} - \frac{3}{4}x^2e^{-2x} - \frac{3}{4}xe^{-2x} - \frac{3}{8}e^{-2x} + C$

29. $\frac{1}{3}(x^4 + 4)e^{3x} - \frac{4}{9}x^3e^{3x} + \frac{4}{9}x^2e^{3x} - \frac{8}{27}xe^{3x} + \frac{8}{81}e^{3x} + C$
 31. $\frac{8}{3}\ln 2 - \frac{7}{9}$ 33. $14\ln 14 - 10\ln 10 - 4$ 35. 1
 37. $\frac{1192}{15}$ 39. $C(x) = \frac{8}{3}x(x+3)^{3/2} - \frac{16}{15}(x+3)^{5/2}$
 41. (a) $-10Te^{-T} - 10e^{-T} + 10$; (b) about 9.084 kW-h
 43. $\frac{2}{125}(5x+1)^{5/2} - \frac{2}{5}(5x+1)^{3/2} + C$; they are the same.
 45. $2\sqrt{x}e^{\sqrt{x}} - 2e^{\sqrt{x}} + C$ 47. $\frac{2}{3}x^{3/2}\ln x - \frac{4}{9}x^{3/2} + C$
 49. $2\sqrt{x}(\ln x) - 4\sqrt{x} + C$
 51. $\frac{2}{7}(27x^3 + 83x - 2)(3x+8)^{7/6} - \frac{4}{91}(81x^2 + 83)$
 $(3x+8)^{13/6} + \frac{1296}{1729}x(3x+8)^{19/6} - \frac{2592}{43225}(3x+8)^{25/6} + C$
 53. $\frac{x^{n+1}}{n+1}(\ln x)^2 - \frac{2x^{n+1}}{(n+1)^2}\ln x + \frac{2x^{n+1}}{(n+1)^3} + C$
 55. Let $u = x^n$ and $dv = e^x dx$. Then $du = nx^{n-1} dx$ and $v = e^x$.
 Next, use integration by parts. 57. 59. About 355,986

Exercise Set 4.7, p. 457

1. $-\frac{1}{9}e^{-3x}(3x+1) + C$ 3. $\frac{6^x}{\ln 6} + C$
 5. $\frac{1}{10}\ln\left|\frac{5+x}{5-x}\right| + C$ 7. $3-x - 3\ln|3-x| + C$
 9. $\frac{1}{8(8-x)} + \frac{1}{64}\ln\left|\frac{x}{8-x}\right| + C$
 11. $(\ln 3)x + x\ln x - x + C$ 13. $\frac{x^5}{5}(\ln x) - \frac{x^5}{25} + C$
 15. $\frac{x^4}{4}(\ln x) - \frac{x^4}{16} + C$ 17. $\ln|x + \sqrt{x^2 + 7}| + C$
 19. $\frac{2}{5-7x} + \frac{2}{5}\ln\left|\frac{x}{5-7x}\right| + C$ 21. $-\frac{5}{4}\ln\left|\frac{x-1/2}{x+1/2}\right| + C$
 23. $m\sqrt{m^2 + 4} + 4\ln|m + \sqrt{m^2 + 4}| + C$
 25. $\frac{5}{2x^2}(\ln x) + \frac{5}{4x^2} + C$ 27. $x^3e^x - 3x^2e^x + 6xe^x$
 $- 6e^x + C$ 29. $\frac{1}{15}(3x-1)(1+2x)^{3/2} + C$
 31. $S(x) = 100\left[\frac{20}{20-x} + \ln(20-x)\right]$
 33. $-4\ln\left|\frac{x}{3x-2}\right| + C$ 35. $\frac{-1}{2(x-2)} + \frac{1}{4}\ln\left|\frac{x}{x-2}\right| + C$
 37. $\frac{-3}{e^{-x}-3} + \ln|e^{-x}-3| + C$

Chapter Review Exercises, p. 466

1. True 2. False 3. True 4. False 5. (e) 6. (d)
 7. (a) 8. (f) 9. (b) 10. (c) 11. \$77,000
 12. $4x^5 + C$ 13. $3e^x + 2x + C$ 14. $t^3 + \frac{5}{2}t^2 + \ln t + C$
 15. 9 16. 21 17. Total number of words keyboarded in t minutes
 18. Total sales in t days
 19. $\frac{b^6 - a^6}{6}$ 20. $-\frac{2}{5}$ 21. $e - \frac{1}{2}$ 22. $2\ln 4$, or $4\ln 2$
 23. $\frac{22}{3}$ 24. Zero 25. Negative 26. Positive
 27. $13\frac{1}{2}$ 28. $\frac{1}{4}e^x + C$ 29. $\ln(4t^6 + 3) + C$
 30. $\frac{1}{4}(\ln 4x)^2 + C$ 31. $-\frac{2}{3}e^{-3x} + C$ 32. $xe^{3x} - \frac{1}{3}e^{3x} + C$
 33. $-\frac{2x}{3} + x\ln x^{2/3} + C$ 34. $x^3\ln x - \frac{x^3}{3} + C$
 35. $e^{3x}\left(\frac{1}{3}x^4 - \frac{4}{9}x^3 + \frac{4}{9}x^2 - \frac{8}{27}x + \frac{8}{81}\right) + C$
 36. $\frac{1}{14}\ln\left|\frac{7+x}{7-x}\right| + C$ 37. $\frac{1}{5}x^2e^{5x} - \frac{2}{25}xe^{5x} + \frac{2}{125}e^{5x} + C$
 38. $\frac{1}{49} + \frac{x}{7} - \frac{1}{49}\ln|7x+1| + C$

39. $\ln|x + \sqrt{x^2 - 36}| + C$ 40. $x^7\left(\frac{\ln x}{7} - \frac{1}{49}\right) + C$
 41. $\frac{1}{64}e^{8x}(8x-1) + C$ 42. About \$70,666.67
 43. $\frac{1}{2}(1 - 3e^{-2})$, or approximately 0.297 44. 80 mi
 45. About \$162,753.79
 46. $10x^3e^{0.1x} - 300x^2e^{0.1x} + 6000xe^{0.1x} - 60,000e^{0.1x} + C$
 47. $\ln|4t^3 + 7| + C$ 48. $\frac{2}{75}(5x-8)\sqrt{4+5x} + C$
 49. $e^x + C$ 50. $\ln(x+9) + C$ 51. $\frac{1}{96}(t^8 + 3)^{12} + C$
 52. $x\ln(7x) - x + C$ 53. $\frac{x^2}{2}\ln(8x) - \frac{x^2}{4} + C$
 54. $\frac{1}{10}[\ln|t^5 + 3|]^2 + C$ 55. $-\frac{1}{2}\ln(1 + 2e^{-x}) + C$
 56. $(\ln\sqrt{x})^2 + C$, or $\frac{1}{4}(\ln x)^2 + C$
 57. $x^{92}\left(\frac{\ln x}{92} - \frac{1}{8464}\right) + C$
 58. $(x-3)\ln(x-3) - (x-4)\ln(x-4) + C$
 59. $\frac{1}{3(\ln x)^3} + C$ 60. $\frac{3}{7}(x+3)^{7/3} - \frac{9}{4}(x+3)^{4/3} + C$
 61. $\frac{1}{16}(2x+1)^2 - \frac{1}{4}(2x+1) + \frac{1}{8}\ln(2x+1) + C$
 62. 1.343

Chapter 4 Test, p. 468

1. [4.2] 95 2. [4.1] $\frac{2\sqrt{3}}{3}x^{3/2} + C$ 3. [4.1] $\frac{500}{3}x^6 + C$
 4. [4.1] $e^x + \ln x + \frac{8}{11}x^{11/8} + C$ 5. [4.3] $\frac{1}{6}$ 6. [4.3] $4\ln 3$
 7. [4.3] Total miles run in t hours 8. [4.3] 12
 9. [4.3] $\frac{1-e^{-2}}{2}$ 10. [4.3] 1 11. [4.4] $\frac{61}{6}$ 12. [4.3] Positive
 13. [4.5] $\ln(x+12) + C$ 14. [4.5] $-2e^{-0.5x} + C$
 15. [4.5] $\frac{(t^4 + 3)^{10}}{40} + C$ 16. [4.6] $\frac{1}{5}xe^{5x} - \frac{1}{25} + C$
 17. [4.6] $\frac{x^4}{4}\ln x^4 - \frac{x^4}{4} + C$, or $x^4\ln|x| - \frac{x^4}{4} + C$
 18. [4.7] $\frac{2^x}{\ln 2} + C$ 19. [4.7] $\frac{1}{7}\ln\left|\frac{x}{7-x}\right| + C$
 20. [4.4] 6 21. [4.4] $\frac{1}{3}$ 22. [4.4] \$49,000 23. [4.3] 94 \text{ words}
24. [4.3] 5.4 km 25. [4.5] $\frac{6}{7}\ln(5+7x) + C$
 26. [4.6] $x^5e^x - 5x^4e^x + 20x^3e^x - 60x^2e^x + 120xe^x - 120e^x + C$
 27. [4.5] $\frac{1}{6}e^x + C$ 28. [4.6, 4.7] $\frac{2}{3}x^{3/2}(\ln x) - \frac{4}{9}x^{3/2} + C$
 29. [4.7] $\frac{1}{16}\ln\left(\frac{8+x}{8-x}\right) + C$
 30. [4.6, 4.7] $-10x^4e^{-0.1x} - 400x^3e^{-0.1x} - 12,000x^2e^{-0.1x}$
 $- 240,000xe^{-0.1x} - 2,400,000e^{-0.1x} + C$
 31. [4.6] $\frac{x^2}{2}\ln(13x) - \frac{x^2}{4} + C$
 32. [4.6] $\frac{1}{15}(3x^2 - 8)(x^2 + 4)^{3/2} + C$
 33. [4.5] $\frac{(\ln x)^4}{4} - \frac{4}{3}(\ln x)^3 + 5\ln x + C$
 34. [4.6] $(x+3)\ln(x+3) - (x+5)\ln(x+5) + C$
 35. [4.6, 4.7] $\frac{3}{10}(8x^3 + 10)(5x-4)^{2/3} - \frac{108}{125}x^2(5x-4)^{5/3} +$
 $\frac{81}{625}x(5x-4)^{8/3} - \frac{243}{34,375}(5x-4)^{11/3} + C$
 36. [4.6] $\frac{2}{7}(3x-2)^{3/2} + \frac{4}{9}(3x-2)^{1/2} + C$
 37. [4.6] $x + 8\ln x - \frac{16}{x} + C$
 38. [4.5] $\frac{1}{\ln 5}e^{(\ln 5)x} + C$, or $\frac{5^x}{\ln 5} + C$ 39. [4.4] 16