45. $\frac{2}{3}\sec^{-1}(|x|/3) + C$

47. $\frac{1}{2}\sin^{-1}(x^2) + C$

49. $2\sin^{-1}\left(\frac{x-3}{4}\right) + C$

51. $\frac{1}{2}\tan^{-1}(x^2) + C$

53. $-\frac{1}{3(x^3+3)} + C$

55. $-\sqrt{1-x^2} + C$

57. $-\frac{2}{3}\cos^{\frac{3}{2}}(x) + C$

59. $\frac{7}{3}\ln|3x+2| + C$

61. $\ln|x^2 + 7x + 3| + C$

63. $-\frac{x^2}{2} + 2\ln|x^2 - 7x + 1| + 7x + C$

65. $\tan^{-1}(2x) + C$

67. $\frac{1}{3}\sin^{-1}\left(\frac{3x}{4}\right) + C$

69. $\frac{3}{2}\ln|x^2 - 2x + 10| + \frac{1}{3}\tan^{-1}\left(\frac{x-1}{3}\right) + C$

71. $\frac{15}{2}\ln|x^2 - 10x + 32| + x + \frac{41\tan^{-1}\left(\frac{x-5}{\sqrt{7}}\right)}{\sqrt{7}} + C$

73. $\frac{x^2}{2} + 3\ln|x^2 + 4x + 9| - 4x + \frac{24\tan^{-1}\left(\frac{x+2}{\sqrt{5}}\right)}{\sqrt{5}} + C$

75. $\tan^{-1}(\sin(x)) + C$

77. $3\sqrt{x^2 - 2x - 6} + C$

79. $-\ln 2$

81. $2/3$

83. $(1-e)/2$

85. $\pi/2$

87. $e^{\pi/3} - 1$

89. 1

91. 2

93. $-\frac{1}{2}\cos(2x + \pi) + \frac{91}{2}$

95. $-\ln|\cos x| + 3x + 5$

Section 5.6

1. F

3. They are superseded by the Trapezoidal Rule; it takes an equal amount of work and is generally more accurate.

5.   (a) 250

    (b) 250

    (c) 250

7.   (a) $2 + \sqrt{2} + \sqrt{3} \approx 5.15$

    (b) $2/3(3 + \sqrt{2} + 2\sqrt{3}) \approx 5.25$

    (c) $16/3 \approx 5.33$

9.   (a) 0.2207

    (b) 0.2005

    (c) 1/5

11.   (a) $9/2(1 + \sqrt{3}) \approx 12.294$

    (b) $3 + 6\sqrt{3} \approx 13.392$

    (c) $9\pi/2 \approx 14.137$

13. Trapezoidal Rule: 3.0241
Simpson's Rule: 2.9315

15. Trapezoidal Rule: 3.0695
Simpson's Rule: 3.14295

17. Trapezoidal Rule: 2.52971
Simpson's Rule: 2.5447

19. Trapezoidal Rule: 3.5472
Simpson's Rule: 3.6133

21.   (a) $n = 150$ (using max $(f''(x)) = 1$)

    (b) $n = 18$ (using max $(f^{(4)}(x)) = 7$)

23.   (a) $n = 5591$ (using max $(f''(x)) = 300$)

    (b) $n = 46$ (using max $(f^{(4)}(x)) = 24$)

25.   (a) Area is 25.0667 cm^2

    (b) Area is 250,667 yd^2

Chapter 6

Section 6.1

1. T

3. Determining which functions in the integrand to set equal to "u" and which to set equal to "dv".

5. $-e^{-x} - xe^{-x} + C$

7. $-x^3\cos x + 3x^2\sin x + 6x\cos x - 6\sin x + C$

9. $x^3 e^x - 3x^2 e^x + 6xe^x - 6e^x + C$

11. $-\frac{1}{2}xe^{-2x} - \frac{e^{-2x}}{4} + C$

13. $\frac{1}{5}e^{2x}(\sin x + 2\cos x) + C$

15. $\frac{1}{13}e^{2x}(2\sin(3x) - 3\cos(3x)) + C$

17. $-\frac{1}{2}\cos^2 x + C$

19. $x\tan^{-1}(2x) - \frac{1}{4}\ln(4x^2 + 1) + C$

21. $x\cos^{-1}x - \sqrt{1-x^2} + C$

23. $-\frac{x^2}{4} + \frac{1}{2}x^2\ln x + 2x - 2x\ln x + C$

25. $\frac{1}{2}x^2\ln(x^2) - \frac{x^2}{2} + C$

27. $2\sqrt{x}\ln x - 4\sqrt{x} + C$

29. $2x + (x+1)(\ln(x+1))^2 - (2x+2)\ln(x+1) + C$

31. $\ln|\sin(x)| - x\cot(x) + C$

33. $\frac{1}{3}(x^2 - 2)^{3/2} + C$

35. $x\sec x - \ln|\sec x + \tan x| + C$

37. $\dfrac{x^{n+1}\ln x}{n+1} - \dfrac{x^{n+1}}{(n+1)^2} + C$

39. $2\sin(\sqrt{x}) - 2\sqrt{x}\cos(\sqrt{x}) + C$

41. $2\sqrt{x}e^{\sqrt{x}} - 2e^{\sqrt{x}} + C$

43. π

45. 0

47. $1/2$

49. $\dfrac{98}{\ln 7} - \dfrac{48}{(\ln 7)^2}$

51. $\frac{1}{2} + \frac{e^{\pi}}{2}$

53. $xe^x\ln x - e^x + C$

55. $\sin x - x\cos x + 9$

57. $\frac{1}{3}x^3\ln x - \frac{x^3}{9} + \frac{7e^3}{9}$

Section 6.2

1. F

3. F

5. $\frac{1}{4}\sin^4(x) + C$

7. $\frac{3}{8}x - \frac{1}{4}\sin(2x) + \frac{1}{32}\sin(4x) + C$

9. $\frac{3}{8}x + \frac{1}{4}\sin(2x) + \frac{1}{32}\sin(4x) + C$

11. $\frac{1}{6}\cos^6 x - \frac{1}{4}\cos^4 x + C$

13. $-\frac{1}{9}\sin^9(x) + \frac{3\sin^7(x)}{7} - \frac{3\sin^5(x)}{5} + \frac{\sin^3(x)}{3} + C$

15. $\tan x - \sec x + C$

17. $\frac{1}{2}\left(-\frac{1}{3}\cos(3x) + \cos(-x)\right) + C$

19. $\frac{1}{2}\left(\frac{1}{\pi}\sin(\pi x) - \frac{1}{3\pi}\sin(3\pi x)\right) + C$

21. $\frac{1}{\pi}\sin(\frac{\pi}{2}x) + \frac{1}{3\pi}\sin(\pi x) + C$

23. $\frac{\sqrt{2}}{4}x - \frac{1}{12}\sin\left(6x + \frac{\pi}{4}\right) + C$

25. $\frac{\tan^5(x)}{5} + C$

27. $\frac{\tan^6(x)}{6} + \frac{\tan^4(x)}{4} + C$

29. $\frac{\sec^5(x)}{5} - \frac{\sec^3(x)}{3} + C$

31. $\frac{1}{3}\tan^3 x - \tan x + x + C$

33. $\frac{1}{4}\tan x \sec^3 x + \frac{3}{8}(\sec x \tan x + \ln|\sec x + \tan x|) + C$

35. $\frac{1}{4}\tan x \sec^3 x - \frac{1}{8}(\sec x \tan x + \ln|\sec x + \tan x|) + C$

37. 0

39. $3\pi/4$

41. 1/2

43. 1/5

45. $\frac{3}{4} + \ln 2$

47. $\frac{1}{2}\tan^2 x + \ln|\cos x| + 4$

49. $\frac{1}{2}\left(-\frac{1}{8}\cos(8x) - \frac{1}{2}\cos(2x)\right) - \frac{11}{16}$

Section 6.3

1. backwards

3. (a) $\tan^2\theta + 1 = \sec^2\theta$

(b) $9\sec^2\theta$.

5. $\frac{1}{2}\left(x\sqrt{x^2+1} + \ln|\sqrt{x^2+1}+x|\right) + C$

7. $\frac{1}{2}\left(\sin^{-1}x + x\sqrt{1-x^2}\right) + C$

9. $\frac{1}{2}x\sqrt{x^2-1} - \frac{1}{2}\ln|x + \sqrt{x^2-1}| + C$

11. $x\sqrt{x^2+1/4} + \frac{1}{4}\ln|2\sqrt{x^2+1/4}+2x| + C =$
    $\frac{1}{2}x\sqrt{4x^2+1} + \frac{1}{4}\ln|\sqrt{4x^2+1}+2x| + C$

13. $4\left(\frac{1}{2}x\sqrt{x^2-1/16} - \frac{1}{32}\ln|4x + 4\sqrt{x^2-1/16}|\right) + C =$
    $\frac{1}{2}x\sqrt{16x^2-1} - \frac{1}{8}\ln|4x + \sqrt{16x^2-1}| + C$

15. $\frac{1}{2}a^2\ln\left(\sqrt{x^2+a^2}+x\right) + \frac{1}{2}x\sqrt{x^2+a^2} + C$

17. $3\sin^{-1}\left(\frac{x}{\sqrt{7}}\right) + C$ (Trig. Subst. is not needed)

19. $\sqrt{x^2-11} - \sqrt{11}\sec^{-1}(x/\sqrt{11}) + C$

21. $\sqrt{x^2-3} + C$ (Trig. Subst. is not needed)

23. $-\frac{1}{\sqrt{x^2+9}} + C$ (Trig. Subst. is not needed)

25. $\frac{1}{18}\frac{x+2}{x^2+4x+13} + \frac{1}{54}\tan^{-1}\left(\frac{x+2}{2}\right) + C$

27. $\frac{1}{7}\left(-\frac{\sqrt{5-x^2}}{x} - \sin^{-1}(x/\sqrt{5})\right) + C$

29. $\frac{1}{2}e^{\sin^{-1}x}\left(x + \sqrt{1-x^2}\right) + C$

31. $\pi/2$

33. $2\sqrt{2} + 2\ln(1+\sqrt{2})$

35. $9\sin^{-1}(1/3) + \sqrt{8}$ Note: the new lower bound is
    $\theta = \sin^{-1}(-1/3)$ and the new upper bound is $\theta = \sin^{-1}(1/3)$.
    The final answer comes with recognizing that
    $\sin^{-1}(-1/3) = -\sin^{-1}(1/3)$ and that
    $\cos\left(\sin^{-1}(1/3)\right) = \cos\left(\sin^{-1}(-1/3)\right) = \sqrt{8}/3$.

37. $\frac{1}{2}\left(x\sqrt{x^2+1} + \ln|\sqrt{x^2+1}+x|\right) + 6$

39. $5\ln\left|\frac{x}{\sqrt{8}} + \frac{\sqrt{x^2-8}}{\sqrt{8}}\right| + 4$

Section 6.4

1. rational

3. $\frac{A}{x} + \frac{B}{x-3}$

5. $\frac{A}{x-\sqrt{7}} + \frac{B}{x+\sqrt{7}}$

7. $3\ln|x-2| + 4\ln|x+5| + C$

9. $\frac{1}{3}(\ln|x+2| - \ln|x-2|) + C$

11. $-\frac{4}{x+8} - 3\ln|x+8| + C$

13. $-\ln|2x-3| + 5\ln|x-1| + 2\ln|x+3| + C$

15. $x + \ln|x-1| - \ln|x+2| + C$

17. $-\ln|x+5| + \frac{1}{2}\ln(x^2+4) + \frac{1}{2}\tan^{-1}\left(\frac{x}{2}\right) + C$

19. $\frac{x^2}{2} + x + \frac{125}{9}\ln|x-5| + \frac{64}{9}\ln|x+4| - \frac{35}{2} + C$

21. $\frac{1}{6}\left(-\ln|x^2+2x+3| + 2\ln|x| - \sqrt{2}\tan^{-1}\left(\frac{x+1}{\sqrt{2}}\right)\right) + C$

23. $\ln|3x^2+5x-1| + 2\ln|x+1| + C$

25. $\frac{9}{10}\ln|x^2+9| + \frac{1}{5}\ln|x+1| - \frac{4}{15}\tan^{-1}\left(\frac{x}{3}\right) + C$

27. $-\ln|x| - \frac{1}{2x^2} + \frac{1}{2}\ln(x^2+1) + C$

29. $\frac{1}{2}\ln|x^2+10x+27| + 5\ln|x+2| - 6\sqrt{2}\tan^{-1}\left(\frac{x+5}{\sqrt{2}}\right) + C$

31. $\frac{1}{3}(\ln|\cos x + 2| - \ln|\cos x - 2|) + C$

33. $\ln(2000/243) \approx 2.108$

35. $\ln(9/5)$

37. $1/8$

Section 6.5

1. Because $\cosh x$ is always positive.

3. $\coth^2 x - \operatorname{csch}^2 x = \left(\frac{e^x + e^{-x}}{e^x - e^{-x}}\right)^2 - \left(\frac{2}{e^x - e^{-x}}\right)^2$

$= \frac{(e^{2x} + 2 + e^{-2x}) - (4)}{e^{2x} - 2 + e^{-2x}}$

$= \frac{e^{2x} - 2 + e^{-2x}}{e^{2x} - 2 + e^{-2x}}$

$= 1$

5.
$$\cosh^2 x = \left(\frac{e^x + e^{-x}}{2}\right)^2$$
$$= \frac{e^{2x} + 2 + e^{-2x}}{4}$$
$$= \frac{1}{2}\frac{(e^{2x} + e^{-2x}) + 2}{2}$$
$$= \frac{1}{2}\left(\frac{e^{2x} + e^{-2x}}{2} + 1\right)$$
$$= \frac{\cosh 2x + 1}{2}.$$

7.
$$\frac{d}{dx}[\operatorname{sech} x] = \frac{d}{dx}\left[\frac{2}{e^x + e^{-x}}\right]$$
$$= \frac{-2(e^x - e^{-x})}{(e^x + e^{-x})^2}$$
$$= -\frac{2(e^x - e^{-x})}{(e^x + e^{-x})(e^x + e^{-x})}$$
$$= -\frac{2}{e^x + e^{-x}} \cdot \frac{e^x - e^{-x}}{e^x + e^{-x}}$$
$$= -\operatorname{sech} x \tanh x$$

9. $\displaystyle\int \tanh x \, dx = \int \frac{\sinh x}{\cosh x} \, dx$
Let $u = \cosh x$; $du = (\sinh x)dx$
$$= \int \frac{1}{u} \, du$$
$$= \ln|u| + C$$
$$= \ln(\cosh x) + C.$$

11. $2\sinh 2x$

13. $\coth x$

15. $x\cosh x$

17. $\dfrac{3}{\sqrt{9x^2+1}}$

19. $\dfrac{1}{1-(x+5)^2}$

21. $\sec x$

23. $y = 3/4(x - \ln 2) + 5/4$

25. $y = x$

27. $1/2\ln(\cosh(2x)) + C$

29. $1/2\sinh^2 x + C$ or $1/2\cosh^2 x + C$

31. $x\cosh(x) - \sinh(x) + C$

33. $\cosh^{-1}(x^2/2) + C = \ln(x^2 + \sqrt{x^4 - 4}) + C$

35. $\frac{1}{16}\tan^{-1}(x/2) + \frac{1}{32}\ln|x - 2| + \frac{1}{32}\ln|x + 2| + C$

37. $\tan^{-1}(e^x) + C$

39. $x\tanh^{-1}x + 1/2\ln|x^2 - 1| + C$

41. 0

43. 2

Section 6.6

1. The interval of integration is finite, and the integrand is continuous on that interval.

3. converges; could also state < 10.

5. $p > 1$

7. $e^5/2$

9. $1/3$

11. $1/\ln 2$

13. diverges

15. 1

17. diverges

19. diverges

21. diverges

23. 1

25. 0

27. $-1/4$

29. -1

31. diverges

33. $1/2$

35. converges; Limit Comparison Test with $1/x^{3/2}$.

37. converges; Direct Comparison Test with xe^{-x}.

39. converges; Direct Comparison Test with xe^{-x}.

41. diverges; Direct Comparison Test with $x/(x^2 + \cos x)$.

43. converges; Limit Comparison Test with $1/e^x$.

Section 6.7

1. F

3. $f'(x) = \dfrac{e^{x^2}}{\sqrt{\pi}\operatorname{erfi} x}$

5. $f'(x) = \dfrac{4}{\sqrt{\pi}}e^{-(2x+3)^2}$

7. $f'(x) = 2x\operatorname{erfi} x + \dfrac{6}{\sqrt{\pi}}x^2 e^{9x^2}$

9. $h'(x) = \dfrac{2}{\sqrt{\pi}}\left(e^{-x^2}\operatorname{erfi} x + e^{x^2}\operatorname{erf} x\right)$

11. $k'(x) = 2\sqrt{\pi}e^{\operatorname{erf}^{-1}(4x)^2} + 5$

13. $\dfrac{\sqrt{\pi}}{4}\operatorname{erf}(2x) + C$

15. $\dfrac{\sqrt{\pi}}{2\sqrt{a}}\operatorname{erf}\left(\sqrt{a}x\right) + C$

17. $x\operatorname{erfi} x - \dfrac{1}{\sqrt{\pi}}e^{x^2} + C$

19. $\dfrac{\sqrt{\pi}}{4}\operatorname{erf}(2x + 5) + C$

21. $\dfrac{\sqrt{\pi}}{2e^9}\operatorname{erfi}(x + 3) + C$

23. $\dfrac{1}{2}xe^{x^2} - \dfrac{\sqrt{\pi}}{4}\operatorname{erfi} x + C$

25. $\dfrac{\sqrt{\pi}}{2}\ln|\operatorname{erfi} x| + C$

27. $e^4\sqrt{\pi}\operatorname{erf}(x - 2) - \dfrac{1}{2}e^{-x^2+4x} + C$

29. $\dfrac{\sqrt{\pi}}{2e^{1/4}}\operatorname{erfi}\left(\ln x + \dfrac{1}{2}\right) + C$

31. $\dfrac{\sqrt{\pi}}{3}\operatorname{erf}\left(x^{3/2}\right) + C$

33. $\dfrac{\sqrt{\pi}}{6}(\operatorname{erf} 1000 - \operatorname{erf} 1)$

35. $\dfrac{\sqrt{\pi}}{2}\operatorname{erf} 1$

37. $\sqrt{\pi}(\operatorname{erfi} 6 - \operatorname{erf} 6)$

39. $2/\sqrt{\pi}$

41. 0

43. ∞

45. $1/\sqrt{\pi}$

47. $\operatorname{Si}(7x) + C$

49. $x\operatorname{Si}(x) + \cos x + C$

51. $\operatorname{Si}(a)$