AP Calculus AB Answers for Even-Numbered HW Problems (Fall, 2019)

Answers for odd-numbered HW problems are in the back of your textbook, and fully-worked solutions for both odd- and even-numbered HW problems are available in the solutions manual located in the classroom. This document provides you with answers for the even-numbered HW problems.

Unit 1: Limits, Continuity, and Rates of Change

HW 1.1 (2.2: 4 – 9, 11, 16, 18, 21)

2.2

4a. 3
4b. 1
4c. DNE
4d. 3
4e. 4
4f. DNE
6a. 4
6b. 4
6c. 4
6d. DNE
6e. 1
6f. –1
6g. DNE
6h. 1
6i. 2
6j. undefined
6k. 3
6l. DNE
8a. $-\infty$
8b. ∞
8c. $-\infty$
8d. ∞
8e. $x=-3,\ x=2,\ x=5$
16. Answers will vary
18. Answers will vary
30. ∞

HW 1.2 (2.3: 1, 2, 5, 9 – 17 odd, 21 – 27 odd, 28, 32)

2.3

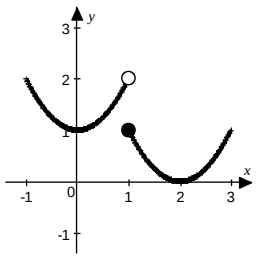
2a. 2
2b. DNE
2c. 0
2d. DNE
2e. 16
2f. 2
28. $-\frac{1}{9}$
32. $-\frac{2}{x^3}$

HW 1.3 (2.3: 37 – 49)

2.3

38. 2
40. 0
42. DNE because $\lim\limits_{x\to -6^-}\frac{2x+12}{|x+6|}=-2\neq \lim\limits_{x\to -6^+}\frac{2x+12}{|x+6|}=2$
44. 1
46. 0
48a. $\lim\limits_{x\to 1^-} f(x)=2;\ \lim\limits_{x\to 1^+} f(x)=1$
48b. DNE

48c.



HW 1.4 (2.2: 3, 30 – 34, 46; 2.6: 1, 4, 7, 9)

2.2

32. $-\infty$

34. $-\infty$

46. ∞

2.6

4a. 2

4b. -1

4c. $-\infty$

4d. $-\infty$

4e. ∞

4f. VA: $x=0$, $x=2$; HA: $y=-1$, $y=2$

HW 1.5 (2.6: 16, 18, 21, 24, 29, 31, 32, 36, 38, 45, 57; Supp 1.5)

2.6

16. 0

18. 2

24. -3

32. ∞

36. 0

38. $-\pi/2$

HW 1.6 (2.5: 3, 18 – 23, 39, 40, 43, 45, 46)

2.5

18. $\lim\limits_{x\to -2^-} f(x)=-\infty$ and $\lim\limits_{x\to -2^+} f(x)=\infty$ → infinite discontinuity at $x=-2$

20. $\lim\limits_{x\to 1} f(x)=1/2$ and $f(1)=1$ → removable discontinuity at $x=1$

22. $\lim\limits_{x\to 3} f(x)=7$ and $f(3)=6$ → removable discontinuity at $x=3$

40. We know that $\sin(x)$ and $\cos(x)$ are continuous for all *x*. Since $\lim\limits_{x\to \frac{\pi}{4}} f(x)=1$ and $f\left(\frac{\pi}{4}\right)=1$, $\lim\limits_{x\to \frac{\pi}{4}} f(x)=f\left(\frac{\pi}{4}\right)\to f$ is continuous at $x=\frac{\pi}{4}$. $\therefore f$ is continuous on $(-\infty,\infty)$.

46. $a=b=1/2$

HW 1.7 (2.5: 49 – 52; Supp 1.7)

2.5

50. Answers will vary

52. The function *f* is continuous on $[0,1]$. Since $f(0)=-1$ and $f(1)=1$, we have $f(0)<0<f(1)$. By IVT, there exists some *c* on $(0,1)$ such that $f(c)=0$.

HW 1.8 (2.7: 42, 43(a, b) 49 – 51; 2.8: 1, 35; Supp 1.8)

2.7

42. $T'(60) = -0.7$ °F/min

50a. The quantity $f'(8)$ represents the rate of change of the amount of coffee sold, in pounds, with respect to the price per pound, in dollars, when the price is \$8/lb. The units for $f'(8)$ are lbs/(\$/lb).

50b. Since people are generally less willing to purchase an item if its price increases, $f'(8) < 0$.

HW 1.9 (2.7: 17; 2.8: 3, 4, 10, 11, 37 – 40; Supp 1.9)

2.8

4. See solutions manual

10. See solutions manual

38. $x = 0$ (discontinuity); $x = 3$ (vertical tangent)

40. $x = -1$ (discontinuity); $x = 2$ (corner/cusp)

HW 1.10 (2.7: 5, 7, 18 – 20, 30, 34, 36, 37; 2.8: 27, 34(a))

2.7

18. $y + 3 = 4(x - 5)$ or $y = 4x - 23$

20. $f(4) = 3;\ f'(4) = 1/4$

30. $f'(a) = -\dfrac{2}{a^3}$

34. $f(x) = \sqrt[4]{x},\ a = 16$ or $f(x) = \sqrt[4]{16 + x},\ a = 0$

36. $f(x) = \tan x,\ a = \pi/4$

2.8

34a. $f'(x) = \dfrac{x^2 - 1}{x^2}$

Unit 2: Differentiation

HW 2.1 (3.1: 4, 5, 6, 10, 11, 13, 14, 16, 18, 19, 23, 26, 29, 34, 35, 49, 52, 54, 65, 66, 71, 73, 74)

3.1

4. $f'(x) = 0$

6. $F'(x) = 6x^7$

10. $h'(x) = 4x - 1$

14. $\dfrac{dy}{dx} = \dfrac{5x^{2/3}}{3} - \dfrac{2}{3x^{1/3}} = \dfrac{5x - 2}{3x^{1/3}}$

16. $h'(t) = \dfrac{1}{4t^{3/4}} - 4e^t$

18. $y' = \dfrac{3\sqrt{x}}{2} - \dfrac{1}{2\sqrt{x}} = \dfrac{3x - 1}{2\sqrt{x}}$

26. $k'(r) = e^r + er^{e-1}$

34. $y - 2 = 7(x - 1)$ or $y = 7x - 5$

52. $x = \ln 2$

54. $y - 8 = 3(x - 4)$ or $y = 3x - 4$

66. $a = 3,\ b = -2,\ c = 7 \rightarrow y = 3x^2 - 2x + 7$

74. $c = 6$

HW 2.2 (3.2: 3, 4, 7, 9, 11, 15, 17, 22, 27, 32, 41, 44, 47, 50)
3.2

4. $g'(x)=\sqrt{x}\,e^x+\dfrac{e^x}{2\sqrt{x}}=\dfrac{e^x(2x+1)}{2\sqrt{x}}$

22. $g'(t)=\dfrac{2}{3t^{1/3}}-\dfrac{1}{6t^{5/6}}$

32. $y=e$

44a. $h'(2)=-38$

44b. $h'(2)=-29$

44c. $h'(2)=13/16$

44d. $h'(2)=-3/2$

50a. $P'(2)=3/2$

50b. $Q'(7)=43/12$

HW 2.3 (3.3: 2, 4, 5, 8, 12, 21, 22, 29, 32, 33, 49; Supp 2.3)
3.3

2. $f'(x)=\sqrt{x}\cos x+\dfrac{\sin x}{2\sqrt{x}}=\dfrac{2x\cos x+\sin x}{2\sqrt{x}}$

4. $y'=2\sec x\tan x+\csc x\cot x$

8. $f'(t)=-\dfrac{\csc^2 t+\cot t}{e^t}$

12. $\dfrac{dy}{dx}=\dfrac{1}{1-\sin x}$

22. $y-1=x$ or $y=x+1$

32a. $g'\left(\dfrac{\pi}{3}\right)=2-\sqrt{3}$

32b. $h'\left(\dfrac{\pi}{3}\right)=\dfrac{1-2\sqrt{3}}{16}$

HW 2.4 (3.4: 7 – 15, 17 – 21)
3.4

8. $F'(x)=100(4-2x)\left(4x-x^2\right)^{99}$

10. $f'(x)=\dfrac{-2\sec x\tan x}{(1+\sec x)^3}$

12. $f'(t)=e^t\cos\left(e^t\right)+e^{\sin t}\cos t$

14. $y'=-3\cos^2 x\sin x$

16. $y'=-2e^{-2t}(2\sin 4t+\cos 4t)$

18. $g'(x)=6x\left(3x^2+4\right)\left(x^2+1\right)^2\left(x^2+2\right)^5$

20. $F'(t)=\dfrac{6(t+3)(3t-1)^3}{(2t+1)^4}$

HW 2.5 (3.4: 16, 22 – 25, 29, 32, 33, 47, 63, 65; 3.9: 7 – 10; Supp 2.5)
3.4

22. $f'(s)=\dfrac{3s}{\sqrt{s^2+1}\left(s^2+4\right)^{3/2}}$

24. $y'=-2\ln(10)\,x10^{1-x^2}$

32. $y'=2m\sec^2(m\theta)\tan(m\theta)$

3.9

8a. $\left.\frac{dx}{dt}\right|_{\left(2,\,\frac{2\sqrt{5}}{3}\right)} = -\frac{\sqrt{5}}{4}$

8a. $\left.\frac{dy}{dt}\right|_{\left(-2,\,\frac{2\sqrt{5}}{3}\right)} = \frac{4}{\sqrt{5}}$

10. $\left.\frac{dx}{dt}\right|_{(4,\,2)} = 6$ cm/s

HW 2.6 (3.5: 6, 7, 8, 11 – 14, 25, 28, 35, 38, 39)

3.5

6. $\frac{dy}{dx} = -\frac{2\sqrt{y}}{\sqrt{x}} = -2\sqrt{\frac{y}{x}}$

8. $\frac{dy}{dx} = \frac{y^3 - 2xy - 6x^2}{x^2 - 3xy^2}$

12. $\frac{dy}{dx} = -\frac{y\sin(xy)}{x\sin(xy) + \cos y}$

14. $\frac{dy}{dx} = \frac{1 + y - e^y \cos x}{e^y \sin x - x}$

28. $y - 2 = \frac{7}{2}(x-1)$ or $y = \frac{7}{2}x - \frac{3}{2}$

38. $\frac{d^2y}{dx^2} = -\frac{3a^4x^2}{y^7}$

HW 2.7 (3.5: 34(a, b), 75, 76; Supp 2.7)

3.5

34a. $y + 2 = -\frac{9}{4}(x-1)$ or $y = -\frac{9}{4}x + \frac{1}{4}$

34b. $(-2, -2), (-2, 2)$

76. $y = 3$ and $y - 3 = \frac{2}{3}(x-12)$ or $y = \frac{2}{3}x - 5$

HW 2.8 (3.5: 49 – 51, 57, 77(b), 78(b, c); Supp 2.8)

3.5

50. $y' = \frac{2x}{1+x^4}$

78b. $f^{-1}(1) = 0$

78c. $\left(f^{-1}\right)'(1) = \frac{1}{2}$

HW 2.9 (3.6: 2, 3, 5, 7, 8, 14, 34, 39, 41, 43, 44, 46)

3.6

2. $f'(x) = \ln x$

8. $f'(x) = \frac{x+1}{x\ln(5)}$

14. $g'(r) = \frac{2r^2}{2r+1} + 2r\ln(2r+1)$

34. $y = x - 1$

44. $\frac{dy}{dx} = x^{\cos x}\left(\frac{\cos x}{x} - \ln(x)\sin(x)\right)$

46. $\frac{dy}{dx} = \frac{\left(\sqrt{x}\right)^x}{2}(1 + \ln x)$

Unit 3: The Shape of a Curve

HW 3.1 (4.2: 2, 3, 5, 9 – 16; 4.3: 1(a, b), 2(a, b), 5, 6)

4.2

2. $c = \dfrac{1+\sqrt{19}}{3} \approx 1.786$

10. $c = \pm\dfrac{2}{\sqrt{3}}$

12. $c = \sqrt{3}$

14. $c = -\ln\left(\dfrac{1-e^{-2}}{2}\right) \approx 0.839$

16. See solution manual for the solution for the first part of this problem. Second question: This does not contradict the MVT since *f* is not differentiable at $x = 1/2$.

4.3

2a. $(0, 1)\cup(3, 5)\cup(5, 7)$

2b. $(1, 3)$

6a. Inc: $(0, 1)\cup(3, 5)$; Dec: $(1, 3)\cup(5, 6)$

6b. Rel. Max: $x = 1,\ x = 5$; Rel. Min: $x = 3$

HW 3.2 (4.3: Parts (a) and (b) for: 9, 11, 12, 14, 15, 16)

4.3

12a. Inc: $(-1, 1)$; Dec: $(-\infty, -1)\cup(1, \infty)$

12b. Rel. Max: $(1, 1/2)$; Rel. Min: $(-1, -1/2)$

14a. Inc: $\left(\dfrac{\pi}{2}, \dfrac{3\pi}{2}\right)$; Dec: $\left(0, \dfrac{\pi}{2}\right)\cup\left(\dfrac{3\pi}{2}, 2\pi\right)$

14b. Rel. Max: $\left(\dfrac{3\pi}{2}, 2\right)$; Rel. Min: $\left(\dfrac{\pi}{2}, -2\right)$

16a. Inc: $\left(e^{-1/2}, \infty\right)$; Dec: $\left(0, e^{-1/2}\right)$

16b. Rel. Min: $\left(e^{-1/2}, \dfrac{1}{2e}\right)$

HW 3.3 (4.3: 1(c – e), 2(c – e), 7, 8, Part (c) for: (9, 11, 12, 14, 15, 16), 19, 22)

4.3

2c. $(2, 4)\cup(5, 7)$

2d. $(0, 2)\cup(4, 5)$

2e. $(2, 2), (4, 3), (5, 4)$

8a. Inc: $(2, 4)\cup(6, 9)$

8b. Rel. Max: $x = 4$; Rel. Min: $x = 2,\ x = 6$

8c. Con. Up: $(1, 3)\cup(5, 7)\cup(8, 9)$; Con. Down: $(0, 1)\cup(3, 5)\cup(7, 8)$

8d. $x = 1, 3, 5, 7, 8$

12c. Con. Up: $\left(-\sqrt{3}, 0\right)\cup\left(\sqrt{3}, \infty\right)$; Con. Down: $\left(-\infty, -\sqrt{3}\right)\cup\left(0, \sqrt{3}\right)$; POI: $\left(-\sqrt{3}, -\sqrt{3}/4\right)$, $\left(0, 0\right)$, $\left(\sqrt{3}, \sqrt{3}/4\right)$

14c. Con. Up: $\left(\dfrac{\pi}{6}, \dfrac{5\pi}{6}\right)$; Con. Down: $\left(0, \dfrac{\pi}{6}\right)\cup\left(\dfrac{5\pi}{6}, \dfrac{3\pi}{2}\right)\cup\left(\dfrac{3\pi}{2}, 2\pi\right)$; POI: $\left(\dfrac{\pi}{6}, -\dfrac{1}{4}\right)$, $\left(\dfrac{5\pi}{6}, -\dfrac{1}{4}\right)$

16c. Con. Up: $\left(e^{-3/2}, \infty\right)$; Con. Down: $\left(0, e^{-3/2}\right)$; POI: $\left(e^{-3/2}, -\dfrac{3}{2e^3}\right)$

22a. $x = 0,\ 4/7,\ 1$

22b. Since $f''(0) = f''(1) = 0$, the Second Derivative Test is inconclusive for $x = 0, 1$. Since $f''(4/7) = \frac{576}{2401} > 0$, f has a relative minimum at $x = 4/7$.

22c. The First Derivative Test indicates that there is a relative maximum at $x = 0$, and a relative minimum at $x = 4/7$.

HW 3.4 (4.4: 1 – 3, 5, 10, 13 – 19 odd, 25, 30, 32, 38, 41, 42, 44, 45)

4.4

2a. Indeterminate: $0 \cdot \infty$

2b. ∞

2c. ∞

10. $11/20$

30. 0

32. $\frac{n^2 - m^2}{2}$

38. 2

42. 0

44. 0

HW 3.5 (4.4: 49 – 53, 56, 57, 58, 59, 65, 71, 72)

4.4

50. 0

52. 0

56. 1

58. e^{ab}

72. 0

HW 3.6 (4.3: 31, 40, 46, 48; 4.5: 5, 11, 17; Midterm Review)

4.3

40a. Inc: $(0, 1)$; Dec: $(-\infty, 0) \cup (1, \infty)$

40b. Rel. Max: $(1, 3)$; Rel. Min: $(0, 0)$

40c. Con. Up: $(-\infty, -1/2)$; Con. Down: $(-1/2, 0) \cup (0, \infty)$; POI: $\left(-\frac{1}{2}, \frac{6}{\sqrt[3]{4}}\right)$

40d. Check with graphing calculator or check solution manual.

46a. HA: $y = 1$

46b. Inc: $(0, \infty)$; Dec: $(-\infty, 0)$

46c. Rel. Min: $(0, -1)$

46d. Con. Up: $\left(-\frac{2}{\sqrt{3}}, \frac{2}{\sqrt{3}}\right)$; Con. Down: $\left(-\infty, -\frac{2}{\sqrt{3}}\right) \cup \left(\frac{2}{\sqrt{3}}, \infty\right)$; POI: $\left(\pm\frac{2}{\sqrt{3}}, -\frac{1}{2}\right)$

46e. Check with graphing calculator or check solution manual.

48a. HA: $y = -1, y = 0$; VA: $x = 0$

48b. Inc: $(-\infty, 0) \cup (0, \infty)$

48c. No relative extreme values

48d. Con. Up: $(-\infty, 0)$; Con. Down: $(0, \infty)$; POI: none

48e. Check with graphing calculator or check solution manual.

Unit 4: Further Applications of Differentiation

HW 4.1 (3.7: 1, 5, 6, 7, 13, 20; Supp 4.1)

3.7

6a. Speeding Up: $(1, 2)\cup(3, 4)$; Slowing Down: $(0, 1)\cup(2, 3)$*

6b. Speeding Up: $(1, 2)\cup(3, 4)$; Slowing Down: $(0, 1)\cup(2, 3)$*

* Explanations not provided – ask in class

20a. $\frac{dF}{dr} = -\frac{2GmM}{r^3}$, which is the instantaneous rate of change of the force with respect to the distance between the bodies. The negative sign indicates that as the distance between the bodies increases, the magnitude of F decreases.

20b. $\left.\frac{dF}{dr}\right|_{r=10,000} = -16$ N/km

HW 4.2 (3.9: 3, 5, 12, 15, 21, 23, 27, 31)

3.9

12. $-\frac{1}{20\pi}$ cm/min

HW 4.3 (3.9: 13, 16, 18, 28, 38, 39, 43)

3.9

16. 0.6 m/s

18a. $-\frac{24}{\sqrt{5}}$ ft/s

18b. $\frac{24}{\sqrt{5}}$ ft/s

28. $-\frac{1}{50}$ rad/s

38. $-\frac{10}{\sqrt{133}}$ ft/s

HW 4.4 (3.10: 4, 5, 24, 25, 27, 28, 34, 35; Supp 4.4)

3.10

4. $f(x) \approx 8 + \frac{3}{8}(x-16)$

24. Using the linear approximation of $f(x) = e^x$ at $x = 0$: $e^{-0.015} \approx 0.985$

28. Using the linear approximation of $f(x) = \sqrt{x}$ at $x = 100$: $\sqrt{99.8} \approx 9.99$

34a. Max. Error $\approx dA = 30.159$ cm^2

34b. Rel. Error $\approx \frac{dA}{A} = \frac{1}{60}$; Percent Error $\approx 1.667\%$

HW 4.5 (4.1: 5, 47, 50, 54, 56, 57, 59, 71)

4.1

50. Abs. Max: $(0, 5)$; Abs. Min: $(-3, -76)$

54. Abs. Max: $(1, 1)$; Abs. Min: $(0, 0)$

56. Abs. Max: $\left(2,\, 6\sqrt[3]{2}\right)$; Abs. Min: $(0,\, 0)$ and $(8,\, 0)$

HW 4.6 (4.7: 3, 7, 11 (ignore parts a-f and just answer the question), 13, 20, 21)

4.7

20. $\left(\frac{5}{2}, \sqrt{\frac{5}{2}}\right)$

HW 4.7 (4.7: 14 – 16, 23, 24, 35, 37)

4.7

14. $40\text{ cm} \times 40\text{ cm} \times 20\text{ cm}$

16. \$163.54

24. $A = 2ab$

Unit 5: Integration

HW 5.1 (5.1: 4, 13 (compute L_6, R_6, and M_3), 15; 7.7: 1, 29(a), 31((a) – compute M_4 and T_4))

5.1

4a. $A \approx 3 + \sqrt{2} + \sqrt{3}$; overestimate

4b. $A \approx 1 + \sqrt{2} + \sqrt{3}$; underestimate

13. Solutions manual only provides solutions for L_6 and R_6. The solution for M_3 is $d \approx 40.5$ ft.

7.7

31. Solutions manual only provides solutions for M_4. The solution for T_4 is $\int_1^5 f(x)\,dx \approx 14.15$.

HW 5.2 (5.2: 3, 8, 18, 22, 34, 36, 37, 40, 48 – 51)

5.2

8a. $\int_3^9 f(x)\,dx \approx 4.2$; f inc → overestimate

8b. $\int_3^9 f(x)\,dx \approx -6.2$; f inc → underestimate

8c. $\int_3^9 f(x)\,dx \approx -0.8$; cannot determine

18. $\int_{\pi}^{2\pi} \frac{\cos x}{x}\,dx$

22. –3 (Be sure to use the limiting value of a Riemann sum, as demonstrated in class.)

34a. $\int_0^2 g(x)\,dx = 4$

34b. $\int_2^6 g(x)\,dx = -2\pi$

34c. $\int_0^7 g(x)\,dx = \frac{9}{2} - 2\pi$

36. $-\frac{9}{2}$

40. 25

48. 8.4

50. 17

HW 5.3 (5.4: 6, 7, 9, 11, 12, 14 – 18)

5.4

6. $\frac{2x^{5/2}}{5} + \frac{3x^{5/3}}{5} + C$

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

14. $-\cot t - 2e^t + C$

16. $\tan t + \sec t + C$

18. $2\sin x + C$

HW 5.4 (5.3: 21 – 35 odd, 43, 44; 5.4: 34, 39, 44 – 46)

5.3

44. $\frac{28}{3}$

5.4

34. $\frac{5}{2} - \frac{4}{\ln 5}$

44. $\frac{5}{2}$

46. 3

HW 5.5 (5.3: 2 – 4, 8, 12, 13, 16, 18, 57, 59 – 63, 67, 76)

5.3

2a. $g(0) = 0$; $g(1) = 1/2$; $g(2) = 0$; $g(3) = -1/2$; $g(4) = 0$; $g(5) = 3/2$; $g(6) = 4$

2b. $g(7) \approx 6.2$

2c. Use absolute extreme on an interval test: Minimum at $x = 3$; Maximum at $x = 7$

2d. Sketch not provided – check solution manual

4a. $g(0) = g(6) = 0$

4b. $g(1) \approx 2.8$; $g(2) \approx 4.9$; $g(3) \approx 5.7$; $g(4) \approx 4.9$; $g(5) \approx 2.8$

4c. $(0, 3)$

4d. Maximum at $x = 3$

4e-f. Sketches not provided – check solution manual

8. $g'(x) = e^{x^2 - x}$

12. $G'(x) = -\cos\sqrt{x}$

16. $y' = 4x^3 \cos^2\left(x^4\right)$

18. $y' = -\sqrt{1 + \sin^2 x}\,\cos x$

60. $(-1, 1)$

62. $g''\left(\frac{\pi}{6}\right) = \frac{\sqrt{15}}{4}$

76a. $g(x) = \begin{cases} 0 & \text{if } x < 0 \\ \frac{x^2}{2} & \text{if } 0 \le x \le 1 \\ -\frac{x^2}{2} + 2x - 1 & \text{if } 1 < x \le 2 \\ 1 & \text{if } x > 2 \end{cases}$

76b. Sketches not provided – check solution manual

76c. f is differentiable on $(-\infty, 0) \cup (0, 1) \cup (1, 2) \cup (2, \infty)$; g is differentiable on $(-\infty, \infty)$

HW 5.6 (5.4: 51, 53, 54, 59 – 64, 65 (use $n = 5$); Supp 5.6)

5.4

54. Total bee population after the first 15 weeks

60a. $-\frac{10}{3}$ m

60b. $\frac{98}{3}$ m

62a. $v(t) = t^2 + 3t - 4$

62b. $\frac{89}{6}$ m

64. 1800 L

HW 5.7 (5.5: 7, 8, 9, 11, 12, 15, 16, 18, 22 – 25, 27 – 29)

5.5

8. $\frac{1}{3}e^{x^3} + C$

12. $\frac{1}{2}\tan(2\theta) + C$

16. $\sin(e^x) + C$

18. $-2\cos\sqrt{x} + C$

22. $-\frac{1}{5}\cos^5\theta + C$

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

28. $-e^{\cos t} + C$

HW 5.8 (5.5: 32, 34, 41, 47, 48, 53, 55, 57, 59, 60, 64)

5.5

32. $-\cos(\ln x) + C$

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

48. $\frac{1}{5}(x^2+1)^{5/2} - \frac{1}{3}(x^2+1)^{3/2} + C$

60. $\frac{1 - e^{-1}}{2}$

64. $\frac{a^3}{3}$

HW 5.9 (5.5: 13, 17, 19, 20, 38, 44, 45, 56, 63, 68, 69, 70; Supp 5.9)

5.5

20. $\frac{1}{3}\ln|z^3 + 1| + C$

38. $2\sqrt{1 + \tan t} + C$

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

56. $\frac{\ln 16}{5}$

68. $\frac{10}{3}$

70. $\frac{\pi^2}{72}$

Unit 6: Applications of Integration & Differential Equations

HW 6.1 (6.5: 1 – 3, 5, 9, 10, 14, 15, 17)

6.5

2. 0

10a. $\frac{4}{\pi}$

10b. $\frac{2}{\ln 3}$

10c. Sketch not provided – see solutions manual

14. $\frac{3 \pm \sqrt{5}}{2}$

HW 6.2 (6.1: 5, 8, 9, 11, 12, 17, 22, 23, 27, 50 – 53)

6.1

8. $\frac{125}{6}$

12. $\frac{64}{3}$

22. $\frac{1}{2}$

50. $\frac{1}{12}$

52a. $a = \frac{8}{5}$

52b. $b = \frac{11 - 4\sqrt{6}}{8}$

HW 6.3 (6.2: 44, 54, 55, 58, 59; Supp 6.3)

6.2

44. $V \approx 5.8 \text{ m}^3$

54. $\frac{16r^3}{3}$

58. 2

HW 6.4 (6.2: 1, 3, 6 – 10)

6.2

6. $\frac{\pi\left(e^4 - e^2\right)}{2}$

8. $\frac{176\pi}{3}$

10. 2π

HW 6.5 (6.2: 11, 12, 14, 15, 17, 23 – 26, 29, 30, 31; Supp 6.5)

6.2

12. 9.525885

14. $\pi\left(2\sqrt{2} - \frac{3}{2}\right)$

24. $\frac{\pi}{9}$

26. $\frac{\pi}{15}$

30. $\frac{4\pi}{15}$

HW 6.6 (9.1: 1, 2, 5; 9.2: 3 – 6; Supp 6.6)

9.1

2. See solutions manual or ask in class

9.2

4. I

6. II

HW 6.7 (9.3: 1 – 5, 9 – 13, 16, 19, 23)

9.3

2. $y = \ln\left(\frac{x^2}{2} + C\right)$

4. $y = \sqrt[3]{3\ln|1+x| + C}$

10. $z = -\ln\left(e^t + C\right)$

12. $y = \sqrt{(\ln x)^2 + 4}$

16. $P = \frac{1}{9}\left(t^{3/2} + 3\sqrt{2} - 1\right)^2$

HW 6.8 (3.8: 2 – 5, 8 – 10, 13 – 16, 20; Supp 6.8)

3.8

2a. $k = \ln 8$

2b. $P(t) = 60e^{(\ln 8)t}$

2c. $P(8) = 1,006,632,960$ bacteria

2d. $P'(8) = 2,093,234,394.25$ cells/hr (cannot get three places even in Float 12!!)

2e. $t = 2.793607$ hr

4a. $k = \frac{3\ln 2}{2}$

4b. 50 bacteria

4c. $y(t) = 50e^{\left(\frac{3\ln 2}{2}\right)t}$

4d. $y(4.5) = 5381.737058$ bacteria (5382 if asked to round to nearest whole bacteria)

4e. $y'(4.5) = 5595.503803$ bacteria/hr

4f. $t = 6.643856$ hr

8a. $y(t) = 50e^{\left(-\frac{\ln 2}{28}\right)t}$

8b. $y(40) = 18.574929$ mg

8c. $t = 130.027973$ days

10a. $t = 12.252835$ years

10b. $t = 28.450202$ years

14. $t = -1.588373$ hr → approx. 11:55 AM

16. $t = 20.273255$ min

20a. $t = 11.552453$ years

20b. $r = 0.0618837 \rightarrow 6.18837\%$