Chapter 4 & Solutions
MATH 251, CALCULUS I, FALL 2018

Section 4.7

5. Maximum distance is $v(\frac{1}{2}) = \frac{9}{4}$
12. The maximum volume is $V(\frac{1}{2}) = 2ft^3$.
15. The largest possible volume is $4000cm^3$.
16. The minimum cost is $C(\sqrt[3]{\frac{9}{2}} \approx \$163.54$
21. $(-\frac{6}{5}, \frac{3}{5})$.
37. *Hint: Let x be the amount of wire used for the square. Write down a function $A(x)$ that is the total area of the square of sides $\frac{x}{4}$ and the traiangle with sides $\frac{10-x}{3}$.*
(a) Maximum area occurs when $x = 10m$, all the wire goes to the square. (b) Minimum area occurs when $x = \frac{40\sqrt{3}}{9+4\sqrt{3}} \approx 4.35m$.
59. (a) Use the quotient rule on $a(x) = \frac{C(x)}{x}$. You should find that the critical point of $a(x)$ occurs when $xC'(x) - C(x) = 0 \implies C'(x) = \frac{C(x)}{x} = a(x)$. (b) $\$389.74perunit$ (b)(ii) 400 (b)(iii) $\$320/unit$.

Section 4.9

3. $F(x) = \frac{x^4}{2} - \frac{2}{9}x^3 + \frac{5}{2}x^2 + C$
12. $F(x) = \frac{3}{5}x^{5/3} + \frac{2}{5}x^{5/2} + C$
15. $G(t) = 2t^{1/2} + \frac{2}{3}t^{3/2} + \frac{2}{5}t^{5/2} + C$
23. $F(x) = x^5 - \frac{1}{3}x^6 + 4$
27. $f(x) = \frac{1}{3}x^3 + 3e^x + Cx + D$.
41. $f(\theta) = -\sin(\theta) - \cos(\theta) + 5\theta + 4$.
63. $s(t) = -10\sin(t) - 3\cos(t) + \dfrac{6}{\pi}t + 3$.

Section 5.1

8 $n = 3$ Upper sum $\frac{92}{27}$ Lower sum $\frac{58}{27}$ $n = 4$ Upper sum $\frac{13}{4}$ Lower sum $\frac{9}{4}$

14 (a) 2.383 miles (b) 2.363 miles (c) The velocity is neither incresing nor decreasing so the estimates are neither upper nor lower estimates

18. 0.725 km

Section 5.2

3. $-\frac{49}{16}$

7. Lower estimate -64 Upper estimate 16.

33. (a) 4 (b) 10 (c) -3 (d) 2.

48. 1.4

49. 122

51 $B < E < A < D < C$

Section 5.3

1 See text

7 $f(x) = \sqrt{x + x^3}$

9 $f(s) = (s - s^2)^8$

11 $F'(x) = -\sqrt{1 + \sec x}$

13. $h'(x) = xe^x$.

19. $\frac{26}{3}$

27. $-\frac{37}{6}$

29. $\frac{82}{5}$

37. $\frac{1}{e+1} + e - 1$

41. $\frac{15}{\ln 2}$

55. $f(x) = x^-4$ is not continuous so we cannot use FTC.

60 $2(1 - 2x)\sin(1 - 2x) + 2(1 + 2x)\sin(1 + 2x)$

Section 5.4

11. $\ln|x| + 2x^{1/2} + x + C$

14. $-r^{-1} + 2\ln|r| + r + C$

25. -2

28. -1

35. $\frac{1}{11} + \frac{9}{\ln 10}$

54. Total population after 15 weeks.

55. Increase in revenue when production is increased from 1000 to 5000 units.

60. (a) $\frac{2}{3}m$ (b) $4m$.

64. 1800 liters

67. $\$58,0000$

Section 5.5

3. $\frac{2}{9}(x^3+1)^{3/2}+C$

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

13. $-\frac{1}{3}\ln|5-3x|+C$

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

21. $\frac{1}{3}(\ln x)^3+C$

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

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

42. $\sin(\ln t)+C$

45. $\arctan x+\frac{1}{2}\ln|1+x^2|+C$

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