MA 223 Even Answers

Section 1.2

12) $15x^2 - 14x - 8$ 16) $36 - 36x + 9x^2$

22) $3x^2 - 2x + 1$ 24) $2x^2 y^2 (2z - x^3 + 3xz^2)$

26) $x^{1/3}(3x^{1/3} - 2)$ 30) $\frac{1}{3}u^{1/2}(u - 3)$ or $u^{1/2}(\frac{1}{3}u - 1)$

48) $2x(3x^2 + 1)^4 (18x^2 + 1)$ 60) $x = 1$ and $x = \frac{1}{3}$

Section 1.4

2) c 4) d 6) b 14) $m = -\frac{1}{3}$

22) slopes are 2 and $-\frac{1}{6}$, lines are not perpendicular

30) $y = -\frac{1}{2}x + \frac{5}{2}$ 32) $x = 2$

34) $y = -\frac{1}{2}x - \frac{5}{2}$ 44) $m = -\frac{5}{8}$ and $b = 3$

46) $y = \frac{4}{3}x + \frac{4}{3}$

Section 2.1

12) $g(-2) = 2$ $g(0) = 1$ $g(2) = 0$ $g(4) = \sqrt{2}$

24) $(-\infty,1) \cup (1,\infty)$ 34) $[1,3) \cup (3,\infty)$

42) See graph section, $[1,\infty)$, $[0,\infty)$ 70) a) $V = -12000n + 120000$

                            b) See graph section   c) \$48000   d) \$12000/yr.

Section 2.2

26) $3x^2 + 20x + 34$ $3x^2 + 2x + 4$ 28) $2\sqrt{x^2 + 1} + 3$ $4x + 12\sqrt{x} + 10$

34) $h(2) = 2$ 44) $-\frac{1}{2}h$

Section 2.3

16) $m = -1$ $b = 6$

18) a) $C(x) = 14x + 100000$ b) $R(x) = 20x$ c) $P(x) = 6x - 100000$ d) $-28000, \ 20000$

20) 118 mg   24) \$128,000

28) in $5\frac{1}{2}$ yr   60) $A(x) = 40x - x^2$, $[0,40]$

Section 2.4

4)   limit does not exist   6)   3   8)   limit does not exist

14)   limit does not exist   34) $\dfrac{1}{2}$ 56)   limit does not exist

60)   4   62)   1   64)   limits do not exist

66)   both limits are 1   68)   1 (to ∞), does not exist (to - ∞)

76)   0

Section 2.5

6)   limit does not exist   40)   1 (from left), 3 (from right)

58)   continuous except at $x = -3$ and $x = 1$

60)   continuous except at $x = -1$ 70)   continuous except at $x = 0$ and $x = 2$

Section 2.6

12)   - 4   16) $4x + 5$ 18) $y = -3x + 4$

22) $y = -\dfrac{3}{2}x + 3$ 26)   a) $-\dfrac{1}{(x-2)^2}$ b) $y = -\dfrac{1}{4}x - \dfrac{3}{4}$ c) See graph sectic

32)   a) 820   b) 20.5 ft/sec   c) $40\dfrac{1}{2}$ ft/sec

34)   a) $-20x + 300$ b) \$100/surfboard   c) \$200/surfboard

Section 3.1

2) $f'(x) = 0$ 10) $f'(r) = 4\pi r^2$ 14) $f'(u) = -u^{-3/2}$

20) $f'(x) = 4x^3 - 4x$ 26) $f'(x) = \dfrac{20}{3}x^{1/3} - x^{1/2} + 2x - 3$

30) $f'(x) = -15x^{-4} + 4x^{-3} + x^{-2}$ 34) $f'(x) = -9x^{-4} - 2x^{-3/2}$

36)   a) 1   b) 23   42) $y = \dfrac{16}{3}x + \dfrac{11}{3}$ 44) $y = \dfrac{3}{16}x + \dfrac{7}{4}$

46) $(0,0), (\dfrac{8}{3}, -\dfrac{256}{27})$ 54)   a) $-3t^2 + 12t + 15$ b) 27, 24   c) 26

56)   a) \$61000/thousand dollars   b) \$46000/thousand dollars
        increasing at a faster rate when amount spent is \$100000 on advertising

Section 3.2

6) $f'(x) = 2(3x^2 - x - 1)$ 　　　　8) $f'(x) = 15x^4 + 8x^3 - 108x^2 - 48x$

10) $f'(x) = x^4 + 4x^3 - 3x^2 - 1$

16) $g'(x) = -\dfrac{3}{2(x+2)^2}$ 　　　　20) $f'(u) = \dfrac{1-u^2}{(u^2+1)^2}$

26) $f'(x) = \dfrac{-2x^2 - 4x + 1}{(2x^2 + 2x + 3)^2}$ 　　　　32) $h'(1) = 2$

44) $y = -\dfrac{9}{2}x + 12$ 　　　　46) $(-1, -\dfrac{1}{2})$ and $(1, \dfrac{1}{2})$

50) a) $\dfrac{0.2(1-t^2)}{(t^2+1)^2}$ 　　b) $0.096\%/hr,\ 0\%/hr,\ -0.024\%/hr$

56) $\$38.4$ million/yr, $\$17.04$ million/yr, $\$5.71$ million/yr

Section 3.3

2) $f'(x) = -3(1-x)^2$ 　　12) $f'(t) = \dfrac{6t-1}{2\sqrt{3t^2-t}}$ 　　16) $f'(x) = -16x(x^2-1)^{-5}$

18) $f'(x) = -\dfrac{2x}{\sqrt{(2x^2-1)^3}}$ 　　32) $g'(u) = -2u(26u^2+11)(1+u^2)^4(1-2u^2)^7$

34) $f'(x) = -\dfrac{10(x+1)^4}{(x-1)^6}$ 　　42) $g'(t) = \dfrac{4(2t-1)(5-3t)}{(3t+2)^5}$ 　　52) $\dfrac{dy}{dx} = 8x(x^2+1)$

56) $h'(0) = -6$

78) a) $r'(t) = \dfrac{10}{27}t^2 - \dfrac{20}{3}t + \dfrac{200}{9}$ 　b) $R'(x) = -\dfrac{9}{5000}r^2 + \dfrac{9}{25}r$ 　c) $\$336,000$/month, $-\$80000$/month

80) $\dfrac{=1600}{\sqrt{t}(8+\sqrt{t})^2}$

Section 3.4

4) a) $\$114, \$120.06, \$138.12$ 　　b) $\$114, \$120, \$138$

6) a) $\overline{C}(x) = \dfrac{5000}{x} + 2$ 　　b) $\overline{C}'(x) = -\dfrac{5000}{x^2}$

10) a) $R(x) = -0.04x^2 + 800x$ 　　b) $R'(x) = -0.08x + 800$ 　　c) $R'(5000) = 400$

12) a) $\$750$ 　b) $\$760$ 　　　　16) a) $\overline{C}'(x) = 0.000004x - 0.02 - \dfrac{60000}{x^2}$ 　　b) $-0.0024, 0.0194$

Section 3.5

10) $h'(x) = (x^2 + 1)(5x^2 - 4x + 1)$ $h''(x) = 4(5x^3 - 3x^2 + 3x - 1)$

14) $g'(u) = (8u - 1)(2u - 1)^2$ $g''(u) = 12(2u - 1)(4u - 1)$

18) $f'(u) = \dfrac{-u^2 + 1}{(u^2 + 1)^2}$ $f''(u) = \dfrac{2u(u^2 - 3)}{(u^2 + 1)^3}$

34) a) $h'(t) = \dfrac{1}{4}t^3 - 3t^2 + 8t$ b) $h'(0) = 0, h'(4) = 0, h'(8) = 0$ c) $h''(t) = \dfrac{3}{4}t^2 - 6t + 8$

d) $h''(0) = 8, h''(4) = -4, h''(8) = 8$ e) $h(0) = 0, h(4) = 16, h(8) = 0$

Section 3.6

2) a) $y' = -\dfrac{3}{4}$ b) $y' = -\dfrac{3}{4}$ 4) a) $y' = -\dfrac{1}{(x-1)^2}$ b) $y' = -\dfrac{1}{(x-1)^2}$

12) $y' = -\dfrac{3x^2}{3y^2 + 1}$ 14) $y' = -\dfrac{2x + 5y}{5x + 2y}$

16) $y' = \dfrac{2y(1 - xy)}{x(3xy - 4)}$ 18) $y' = -\left(\dfrac{y}{x}\right)^{2/3}$

26) $y' = -\dfrac{8x + 6y - 1}{6x + 1}$ 34) $y = \dfrac{2}{3}x - \dfrac{5}{3}$

36) $y'' = -\dfrac{2x(x^3 + y^3)}{y^5}$ 40) 14.18 ft/sec

42) - 500 tires/week   48) 7.5 cu in/sec

52) 40.6 ft/sec   54) 3.04 ft/sec

56) a) 0.0064 cm/sec, $1.6\,cm^3/sec$ 60) 3.75 ft/sec

Section 3.7

16) a) $dy = (6x - 2)dx$ b) $dy \approx -0.3$ c) $\Delta y = -0.2973$

18) a) $dy = \dfrac{dx}{\sqrt{2x + 1}}$ b) $dy \approx 0.03333$ c) $\Delta y = 0.03315$

20) $dy = \dfrac{dx}{2\sqrt{x}}, \sqrt{17} \approx 4.125$ 24) $dy = \dfrac{1}{4}x^{-3/4}dx, \sqrt[4]{81.6} \approx 3.0056$

30) $270\,cm^3$ 32) $\pm 0.076\,cm^3$

4.1

22) decreasing : $(-\infty,-1) \cup (0,1)$, increasing $(-1,0) \cup (1,\infty)$

24) decreasing : $(-\infty,-\frac{3}{2}) \cup (-\frac{3}{2},\infty)$

26) decreasing : $(-\infty,-1) \cup (1,\infty)$, increasing : $(-1,1)$

34) decreasing : $(0,1) \cup (1,2)$, increasing : $(-\infty,0) \cup (2,\infty)$

60) relative maximum : $(-2,84)$ relative minimum : $(2,-44)$

64) relative maximum : $(-3,-4)$ relative minimum : $(3,8)$

66) relative minimum : $(10,610)$ 74) increasing : $(0,4000)$, decreasing : $(4000,\infty)$

4.2
10) b 12) c 22) concave downward : $(-\infty,\infty)$

26) concave upward : $(-\infty,0) \cup (1,\infty)$, concave downward : $(0,1)$

40) concave downward : $(-\infty,2) \cup (2,\infty)$ 44) $(\frac{1}{2},\frac{1}{2})$

54) relative minimum : $(-\frac{3}{4},\frac{47}{8})$ 56) relative maximum : $(-\sqrt{2},4\sqrt{2})$, relative minimum : $(\sqrt{2},-$

68) relative minimum : $(0,0)$

4.3
12) horizontal : $y = 0$, vertical : $x = -2$ 20) no horizontal, vertical : $x = -2, x = 2$
34,44,52,54,56 See graph answers

4.4
16) absolute minimum : $(1,-4)$ absolute maximum : $(4,5)$
20) absolute maximum : $g(1) = 3, g(-2) = 3$, absolute minimum : $g(-3) = -1, g(0) = -1$

26) absolute minimum : $g(1) = 8$ absolute maximum : $f(3) = \frac{80}{3}$ 56) 11 : 30 AM

4.5

2) 500 yd. x 1500 yd., A = 750,000 sq. yd. 4) $\frac{14}{3}$ in.by $\frac{35}{3}$ in. by $\frac{5}{3}$ in.

6) 6 in. by 6 in. by 3 in. 8) 2 ft. by 2 ft. by 5 ft. 10) 5 in. by 10 in.
16) 20 trees/acre 24) 56.57 mph

5.1
22) $x = -3$ 24) $x = 0, x = 3$ 26) $x = 1$
28,32 See graph answers

5.2

18) $\ln\dfrac{\sqrt{x}y^2}{3z}$ 　　　 22) $\log x - \dfrac{1}{2}\log(x^2+1)$ 　　　 34) See graph answers

36) $t = -\dfrac{\ln 2.7}{3} \approx -0.3311$ 　　　 40) $t = \dfrac{\ln 9}{0.4} \approx 5.4931$ 　　　 42) $t = \dfrac{\ln 3}{0.3} \approx 3.6620$

5.3

2) \$26,496.48 　　　 10) \$37,518.26, \$12,518,26 　　　 12)　13.75%

18) approximately 2.8 yr. 　　 28) \$15,000 　　 34) investment A is higher (1.47746 to 1.47698)

5.4

2) $3e^x$ 　　　　 4) $-2e^{-2x}$ 　　　　 20) $-\dfrac{e^{(1/2)x}}{2x^2}$ 　　　 22) $9e^{-3x}(4-e^{-3x})^2$

34) $y = -\dfrac{2}{e} + \dfrac{3}{e}$ 　 36) increasing : $(0,2)$　decreasing : $(-\infty,0) \cup (2,\infty)$

38) concave downward : $(-\infty,-2)$, concave upward : $(-2,\infty)$

48) see graph answers 　　 54) (a) 0.094, 0.075　(b) 0.151, - 0.021

5.5

4) $\dfrac{2}{2x+1}$ 　　　　 6) $\dfrac{10}{t}$ 　　　 10) $-\dfrac{3}{x}$ 　　　 14) $-\dfrac{2}{x^2-1}$

50) increasing : $(0,e)$　decreasing : (e,∞) 　　 54)　$(e^{-3.2}, -\dfrac{3}{2}e^{-3})$

56) absolute minimum : (e,e)　absolute maximum : $(5, 3.1067)$

58) increases by approximately 2.78 kg 　　 64) See graph answers

5.6
6) $\approx$ \$176,198
8) 80 mg