

MA 223 Even Answers

Section 1.2

12) $15x^2 \square 14x \square 8$

22) $3x^2 \square 2x + 1$

26) $x^{1/3}(3x^{1/3} \square 2)$

48) $2x(3x^2 + 1)^4(18x^2 + 1)$

16) $36 \square 36x + 9x^2$

24) $2x^2y^2(2z \square x^3 + 3xz^2)$

30) $\frac{1}{3}u^{1/2}(u \square 3)$ or $u^{1/2}(\frac{1}{3}u \square 1)$

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 $\square \frac{1}{6}$, lines are not perpendicular

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

32) $x = 2$

34) $y = \square \frac{1}{2}x \square \frac{5}{2}$

44) $m = \square \frac{5}{8}$ and $b = 3$

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

Section 2.1

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

24) $(\square, 1) \square (1,)$

34) $[1, 3) \square (3,)$

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

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) $\square \frac{1}{2}h$

Section 2.3

16) $m = \square 1$ $b = 6$

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

20) 118 mg

24) \$128,000

28) in $5\frac{1}{2}$ yr

60) $A(x) = 40x \square x^2, [0, 40]$

Section 2.4

- 4) limit does not exist 6) 3 8) limit does not exist
 14) limit does not exist 34) $\frac{1}{2}$ 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) $y = -\frac{3}{2}x + 3$ 26) a) $-\frac{1}{(x-2)^2}$ b) $y = -\frac{1}{4}x - \frac{3}{4}$ c) See graph section
 32) a) 820 b) 20.5 ft/sec c) $40\frac{1}{2}$ ft/sec
 34) a) $-20x + 300$ b) \$100/surfboard c) \$200/surfboard

Section 3.1

- 2) $f'(x) = 0$ 10) $f'(r) = 4\sqrt{r}r^2$ 14) $f'(u) = -u^{-3/2}$
 20) $f'(x) = 4x^3 - 4x$ 26) $f'(x) = \frac{20}{3}x^{1/3} - x^{1/2} + 2x - 3$
 30) $f'(x) = -15x^{-4} + 4x^{-3} + x^{-2}$ 34) $f'(x) = -9x^{-4} - 2x^{-3/2}$
 36) a) 1 b) 23 42) $y = \frac{16}{3}x + \frac{11}{3}$ 44) $y = \frac{3}{16}x + \frac{7}{4}$
 46) $(0,0), (\frac{8}{3}, -\frac{256}{27})$ 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) $g'(x) = -\frac{3}{2(x+2)^2}$ 20) $f'(u) = \frac{1-u^2}{(u^2+1)^2}$
 26) $f'(x) = \frac{-2x^2 - 4x + 1}{(2x^2 + 2x + 3)^2}$ 32) $h'(1) = 2$
 44) $y = -\frac{9}{2}x + 12$ 46) $(-1, \frac{1}{2})$ and $(1, \frac{1}{2})$
 50) a) $\frac{0.2(1-t^2)}{(t^2+1)^2}$ 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) $f'(t) = \frac{6t-1}{2\sqrt{3t^2-t}}$ 16) $f'(x) = -16x(x^2-1)^{15}$
 18) $f'(x) = -\frac{2x}{\sqrt{(2x^2-1)^3}}$ 32) $g'(u) = -2u(26u^2+11)(1+u^2)^4(1-2u^2)^7$
 34) $f'(x) = -\frac{10(x+1)^4}{(x-1)^6}$ 42) $g'(t) = \frac{4(2t-1)(5-3t)}{(3t+2)^5}$ 52) $\frac{dy}{dx} = 8x(x^2+1)$
 56) $h'(0) = -6$
 78) a) $r'(t) = \frac{10}{27}t^2 - \frac{20}{3}t + \frac{200}{9}$ b) $R'(x) = -\frac{9}{5000}r^2 + \frac{9}{25}r$ c) \$336,000/month, -\$80,000/month
 80) $\frac{=1600}{\sqrt{t}(8+\sqrt{t})^2}$

Section 3.4

- 4) a) \$114, \$120.06, \$138.12 b) \$114, \$120, \$138
 6) a) $\bar{C}(x) = \frac{5000}{x} + 2$ b) $\bar{C}'(x) = -\frac{5000}{x^2}$
 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) $\bar{C}'(x) = 0.000004x - 0.02 - \frac{60000}{x^2}$ b) -0.0024, 0.0194

Section 3.5

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

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

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

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

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

Section 3.6

$$2) \quad a) \quad y' = -\frac{3}{4} \quad b) \quad y' = -\frac{3}{4}$$

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

$$12) \quad y' = -\frac{3x^2}{3y^2 + 1}$$

$$14) \quad y' = -\frac{2x + 5y}{5x + 2y}$$

$$16) \quad y' = \frac{2y(1 - xy)}{x(3xy - 4)}$$

$$18) \quad y' = -\frac{y}{x} \frac{2}{3}$$

$$26) \quad y' = -\frac{8x + 6y - 1}{6x + 1}$$

$$34) \quad y = \frac{2}{3}x - \frac{5}{3}$$

$$36) \quad y'' = -\frac{2x(x^3 + y^3)}{y^5}$$

$$40) \quad 14.18 \text{ ft/sec}$$

$$42) \quad -500 \text{ tires/week}$$

$$48) \quad 7.5 \text{ cu in/sec}$$

$$52) \quad 40.6 \text{ ft/sec}$$

$$54) \quad 3.04 \text{ ft/sec}$$

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

Section 3.7

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

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

$$20) \quad dy = \frac{dx}{2\sqrt{x}}, \sqrt{17} \approx 4.125$$

$$24) \quad dy = \frac{1}{4}x^{3/4}dx, \sqrt[4]{81.6} \approx 3.0056$$

$$30) \quad 270 \text{ cm}^3$$

$$32) \quad \pm 0.076 \text{ cm}^3$$

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 : $(\sqrt{2}, -4\sqrt{2})$
 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) $x = \frac{1}{3}$ 24) $x = 0, x = 3$ 26) $x = 1$

28,32 See graph answers

5.2

- 18) $\ln \frac{\sqrt{x}y^2}{3z}$ 22) $\log x \leq \frac{1}{2} \log(x^2 + 1)$ 34) See graph answers
 36) $t = \frac{\ln 2.7}{3} \approx 0.3311$ 40) $t = \frac{\ln 9}{0.4} \approx 5.4931$ 42) $t = \frac{\ln 3}{0.3} \approx 3.6620$

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) $\frac{1}{2}e^{2x}$ 20) $\frac{e^{(1/2)x}}{2x^2}$ 22) $9e^{3x}(4 - e^{3x})^2$
 34) $y = \frac{2}{e} + \frac{3}{e}$ 36) increasing: $(0, 2)$ decreasing: $(\frac{1}{2}, 0) \cup (2, \infty)$
 38) concave downward: $(\frac{1}{2}, \frac{1}{2})$, concave upward: $(\frac{1}{2}, \infty)$
 48) see graph answers 54) (a) 0.094, 0.075 (b) 0.151, -0.021

5.5

- 4) $\frac{2}{2x+1}$ 6) $\frac{10}{t}$ 10) $\frac{3}{x}$ 14) $\frac{2}{x^2} - 1$
 50) increasing: $(0, e)$ decreasing: (e, ∞) 54) $(e^{3.2}, \frac{3}{2}e^3)$
 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