Text Answers Sections 8-12

Section 8

1. $f'(x) = 0$ 2. $y' = 18x^2 - 6x + 2$ 3. $f'(x) = -12x^{-7}$

4. $y' = -\frac{1}{x^2} + \frac{2}{x^2} - \frac{1}{x^4}$ 5. $f'(r) = 4\pi r^2$ (surface area of sphere)

6. $R'(q) = -\frac{q}{50} + 4$ (a) $R'(60) = 2.8$ (b) $R'(120) = 1.6$ (c) $R'(400) = -4$

7. $C'(x) = 12x$ $R'(x) = 8$ $P'(x) = 8 - 12x$ $P'(x) = 0$ *when* $x = \frac{2}{3}$

8. (a) $f'(x) = .3x^2 - .4$ (b) $f'(10) = \$29.6 / thousand\ items$ $f(10) = \$156 / thousand\ items$

9. $y' = 6x^2 - 2x + 2$ 10. $f'(x) = 7x^6 - 8x^3$ 11. $y' = \dfrac{3x^2 - 6x - 1}{(x-1)^2}$

12. $y' = \dfrac{-15}{(x-1)^2}$ 13. $g'(x) = \dfrac{x^2 + 4x - 9}{(x+2)^2}$ 14. $f'(x) = \dfrac{-6}{(2x-4)^2}$

15. $y = -2$ 16. $h'(3) = f'(3) \cdot g(3) + g'(3) \cdot f(3) = 59$

17. (a) $d'(x) = \dfrac{-x}{(.01x^2 + 1)^2}$ $d'(5) = -3.2$ $d'(10) = -2.5$ $d'(15) = -\frac{240}{169}$

Section 9

1. $f(g(x)) = \dfrac{3x + 95}{8}$ $g(f(x) = \dfrac{3x + 280}{8}$ 2. $f(g(x)) = -\frac{2}{x} + 1$ $g(f(x)) = \dfrac{-1}{2x+1}$

3. $f'(t) = 4(2t + 1)$ 4. $f'(t) = -4(2x+1)^{-5}(2)$ 5. $f'(x) = \dfrac{-56x}{(4x^2 + 1)^8}$

6. $f'(x) = 6(5x^4 - 1)^2 + 2(5x^4 - 1)20x^3 6x$ 7. $f'(x) = -\dfrac{56(x+2)}{(3x-1)^3}$

8. $f'(x) = \dfrac{3(x^2+2)^2 2x(x^2-1)^5 - 5(x^2-1)^4 2x(x^2+2)^3}{(x^2-1)^{10}}$ 9. $f'(x) = \dfrac{420(9x+1)^{19}}{(1-12x)^{21}}$

10. Change the problem to "Find the equation of the tangent line when $t = 1$."
$g'(t) = (t^2 - 4t + 5)^4 + 4(t^2 - 4t + 5)^3(2t - 4)t$ Tangent line: $y - 16 = -48(x - 1)$

11. $R(p) = -\frac{4p(p+1)^2}{3} + 80p \qquad R'(4) = -\frac{20}{3}$

12. Change the problem in three places: Change the cost function to $C = 200x + 35{,}000$, delete the exponent 4 on the demand equation, and change the price to $500 in part (d). Then, the answers are:

(a) $R(p) = 1500p - 1.5p^2$ (b) $P(p) = -1.5p^2 + 1800p - 335{,}000$

(c) $P'(p) = -3p + 1800$ (d) $P'(500) = 300$

Section 10

1. $\frac{dy}{du} = 2u \qquad \frac{du}{dx} = 3 \qquad \frac{dy}{dx} = 6(3x-2)$

2. $\frac{dy}{du} = \frac{4}{5}u^{-\frac{1}{5}} \qquad \frac{du}{dx} = 2x-1 \qquad \frac{dy}{dx} = \frac{4}{5}\left(x^2 - x + 1\right)^{-\frac{1}{5}}(2x-1)$

3. $\frac{dy}{du} = -\frac{1}{(u-1)^2} \qquad \frac{du}{dx} = 3x^2 \qquad \frac{dy}{dx} = -\frac{3x^2}{(x^3-1)^2}$

4. $\frac{dy}{du} = -\frac{1}{2u} \qquad \frac{du}{dx} = \frac{1}{2\sqrt{x}} \qquad \frac{dy}{dx} = \frac{-1}{(\sqrt{x}+6)} \cdot \frac{1}{2\sqrt{x}}$

5. $f''(u) = 8 \qquad f''(0) = 8 \qquad f''(2) = 8$

6. $f''(t) = -\frac{1}{4}(t+4)^{-\frac{3}{2}} \qquad f''(0) = -\frac{1}{32} \qquad f''(2) = -\frac{1}{24\sqrt{6}}$

7. $f''(x) = 6(60x^4 - 24x^2 + 1) \qquad f''(0) = 6 \qquad f''(2) = 5190$

8. $f''(x) = \frac{-3 + 2\ln x}{4x^3}$

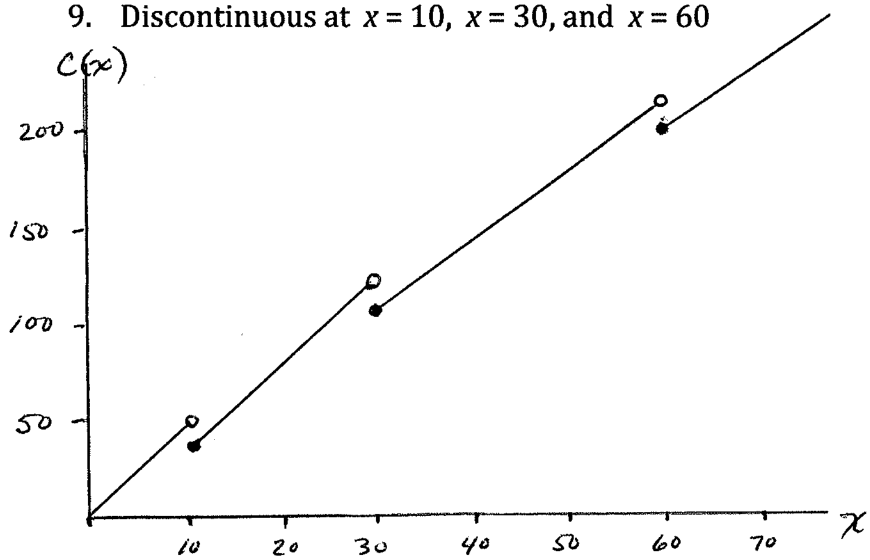
9. $f'(x) = \frac{x}{x^2+1} \qquad f''(x) = \frac{1-x^2}{(x^2+1)^2}$

Section 11

1. None
2. None
3. $x = 2$
4. $x = -3,\ x = 2$
5. None
6. Discontinuous at $x = -1$ and at $x = 3$ $\lim_{x\to -1^-} f(x) = 6 \qquad \lim_{x\to -1^+} f(x) = 1$
   $\lim_{x\to 3^-} f(x) = 29 \qquad \lim_{x\to 3^+} f(x) = 8$
7. Discontinuous at $x = 0$ $\lim_{x\to 0^-} f(x) = 4 \qquad \lim_{x\to 0^+} f(x) = 0$

8. $c = 6$ 9. (a) \$72 (b) \$200 (c) \$120 (d) $x = 100$

9. Discontinuous at $x = 10$, $x = 30$, and $x = 60$



Section 12

1. $(5, -33)$ 2. $\left(\sqrt[3]{6}, \frac{-9\sqrt[3]{6}}{2} + 2\right)$ 3. $\left(\frac{2}{3}, -\frac{31}{27}\right)$ and $(0, -1)$

4. $(0, -90)$ and $\left(\frac{1}{\sqrt{2}}, \frac{-195}{2}\right)$ and $\left(\frac{-1}{\sqrt{2}}, \frac{-195}{2}\right)$ 5. $(1, 0)$ and $(5, 8)$

6. $(1, +4)$ 7. $(1, -3)$ and $(0, 0)$ 8. $(4, 0)$

Note: $x=0$ and $x=\frac{16}{5}$ are not in the domain

9. (a) 6 (b) \$5784