Text Answers Sections 16, 18-22

Section 16

1. $\frac{6}{5}$ 2. 1 3. ∞ 4. 0 5. D.N.E. RHL = $-\infty$ and LHL = ∞.

6. -3 7. $y=0,\ x=0$ 8. $y=0,\ x=0$ 9. $y=1,\ x=-1$

10. $y=\frac{3}{5},\ x=\sqrt{\frac{6}{5}},\ x=-\sqrt{\frac{6}{5}}$ 11. $y=0,\ x=-\frac{1}{2},\ x=1$

Section 17

Answers are listed in separate file.

Section 18

1. Abs. Max. at $x=5$, Abs. Min. at $x=0$ and at $x=3$

2. Abs. Max. at $x=0$, Abs. Min. at $x=4$ 3. Abs. Max. at $x=2$, Abs. Min. at $x=4$

4. Abs. Max. at $x=\sqrt{3}$, Abs. Min. at $x=0$ (note: $\frac{\sqrt{3}}{6}\approx .29$ *and* $\frac{5}{8}\approx .18$)

5. Abs. Max at $x=0$, no Abs. Min. 6. Abs. Max. at $x=10$, Abs. Min. at $x=1$

7. \$12.50 8. Max occurs when $x=10$. $P(10)=700$. So, sell 1,000,000 items for a profit of \$700,000.

9. 3,000

Section 19

1. (a) \$3382.26 (b) \$3439.16 (c) \$3468.55 (d) \$3488.50

2. (a) \$1967.15 (b) \$2001.60 (c) \$2009.66 (d) \$2013.75

3. The 8% investment is better, yielding \$111.30 more interest.

4. $g'(x)=e^{x+4}$ 5. $f'(x)=12e^{4x}$ 6. $y'=-e^{x+1}$ 7. $f'(x)=-.1e^{-.01x}$

8. $f'(x)=e^{x}(x+1)$ 9. $y'=2(x-3)(x-2)e^{2x}$ 10. $f'(x)=\dfrac{-4}{(e^{x}-e^{-x})^2}$

11. $f'(x)=4(2x+e^{-x^2})(1-xe^{-x^2})$ 12. $P\left(1+\frac{r}{n/T}\right)^{\frac{n}{T}T}=P\left(1+\frac{rT}{n}\right)^{n}$ 13. Pe^{rT}

Section 20

1. $y' = \frac{1}{x}$ 2. $g'(x) = \frac{4}{4x-1}$ 3. $f'(x) = \frac{1-\ln x}{x^2}$ 4. $y' = \frac{1}{2x+1}$

5. $h'(x) = \frac{-1}{2x^2 - x}$ 6. $f'(x) = 28$ 7. $f'(x) = \frac{x+1-x\ln x}{x(x+1)^2}$

8. $y' = \frac{1}{(2x-3)\ln 8}$ 9. $f'(t) = \frac{t^2-1}{\ln 6(t^2+1)t}$ 10. $P'(x) = \frac{60}{4x+1} - 3$

11. $R'(x) = 100 + \frac{50(\ln x - 1)}{(\ln x)^2}$ 12. $-5^{-x}\ln 5$ 13. $\frac{dy}{dx} = -6x(10^{3x^2-2})\ln 10$

Section 21

1. $\frac{dy}{dx} = \frac{-x}{3y}$ 2. $\frac{dy}{dx} = \frac{9-2xy^2-2y}{2x^2y+2x}$ 3. $\frac{dy}{dx} = \frac{\frac{-2}{x^2} - 3y}{3x - \frac{1}{3}} = \frac{-(6+9x^2y)}{9x^3 - x^2}$

4. $\frac{dy}{dx} = \frac{\frac{-y}{x} + \frac{3}{2}x^{\frac{1}{2}}y^{\frac{7}{2}}}{\ln x - \frac{7}{2}y^{\frac{5}{2}}x^{\frac{3}{2}}}$ 5. $\frac{dy}{dx} = \frac{2y - 10x(x^2+y^3)^4}{15y^2(x^2+y^3)^4 - 2x}$ 6. $y - 2\sqrt{5} = \frac{1}{\sqrt{5}}(x-2)$

7. $m = \frac{1-\ln 3}{9}$ (note: when $x = 3$, $y = \frac{\ln 3}{3}$)

8. (a) $\frac{dC}{dx} = \frac{x}{C} + \frac{25}{C\sqrt{x}}$ So, at $x = 5$, $\frac{dC}{dx} = \frac{1+\sqrt{5}}{\sqrt{5+4\sqrt{5}}}$

At the instant when 500 units are being sold, the Cost is <u>increasing</u> at the rate of

$\frac{1+\sqrt{5}}{\sqrt{5+4\sqrt{5}}} \approx .8666$ dollars(?) per 100 items sold. Assume \$ (the problem didn't say).

(b) $\frac{dR}{dx} = -\frac{900(x-4)}{R}$ So, at $x = 5$, $\frac{dR}{dx} = -\frac{90}{\sqrt{246}}$

At the instant when 500 units are being sold, the Revenue is <u>decreasing</u> at the rate of $\frac{90}{\sqrt{246}} \approx 5.738$ dollars(\$) per 100 items sold.

Section 22

1. $x = 100$, $y = 50$ 2. 60 x 60 square garden 3. $\frac{16}{3}, \frac{16}{3}, \frac{4}{3}$ (l, w, h) inches

4. (a) $R(x) = 200x - \frac{x^2}{30}$ (b) $x = 3{,}000$ (c) $R(3{,}000) = 300{,}000$ cents = \$3,000

5. Each dimension 5.04 inches (l = w = h)

6. (a) $R(x) = 4x - \frac{x^2}{12}$ (b) $x = 24$ (c) $R(24) = \$48$ 7. $\frac{dy}{dt} = -\frac{5}{14}$

8. $\frac{dx}{dt} = -\frac{1}{9}$ (decreasing at rate of $\frac{1}{9}$ thousand watches/wk, or approx 111 watches/wk)

9. (a) 180 (b) 50 (c) 130 (\$/day) 10. 7.5 ft./sec.

11. (a) -60 or 10 (only 10 makes sense since *x* can't be negative) (b) 10

12. 2.5 ft./sec. 13. Increasing at rate of 54 patients/year.

14. It needs a domain restriction. Perhaps only allow populations greater than 20,000 (current population).

15. $x = \frac{1600}{21} \approx 76$ *units* 16. *Decreasing* at rate of $\frac{1}{50\pi}$ cm/min.

17. Radius and height should both be $\sqrt[3]{\frac{100}{\pi}}$ cm.