Answers - Part 1

1. $\frac{13}{4}$ $\quad \frac{-5}{3}$ $\quad \frac{1}{4}$ $\quad 23$

   5 $\quad 5$ $\quad \frac{8}{6}$ $\quad -2$ $\quad \frac{1}{4}$

2. (a) 17 (b) 8 (c) 17 (d) does not exist

   (e) does not exist (f) -2 (g) -2 (h) -2

3. (a) $20x^4 - 6x^2 + 5$

   (b) $(8x+35)(x^5-7x^3+x) + (5x^4-21x^2+1)(4x^2+35x-87)$

   (c) $-20(-x^7+3x^2+2)^{-21}(-7x^6+6x)$

   (d) $$\frac{(2x+3)(5x^4+3) - (20x^3)(x^2+3x-5)}{(5x^4+3)^2}$$

   (e) $\frac{1}{2}\left[x+(2x+16)^5\right]^{-1/2}\left[1+5(2x+16)^4\cdot 2\right]$

   (f) $12x^3 - 10x$

   (g) $(3x^2+6)(x^4-x^2+3) + (4x^3-2x)(x^3+6x-4)$

   (h) $-(3x+2)^{-2}\cdot 3$

   (i) $4x+3+\frac{1}{2}(2x)^{-1/2}\cdot 2 - 2x^{-3}$

   (j) $7\left[3x^2+\sqrt{4x-1}\right]^6\left[6x+\frac{1}{2}(4x-1)^{-1/2}\cdot 4\right]$

   (k) $(2x-\frac{1}{2}x^{-1/2})(7+2x-9x^2) + (2-18x)(x^2-\sqrt{x})$

   (l) $$\frac{[(3x^2+5)(x^2+4x+4)+(2x+4)(x^3+5x+1)](x^5+3) - 5x^4(x^3+5x+1)(x^2+4x+4)}{(x^5+3)^2}$$

$$\frac{dh}{dy} = \frac{1(2y-5)-2(1+y)}{(2y-5)^2}$$

3(continued)

$$\left.\frac{dy}{dx}\right|_{x=2} = -\frac{3}{2}(2)^{-5/2}$$

$$\frac{dt}{dx} = 2(4x-4)$$

4. $$\frac{1}{(x^7+2x+5)^2+1}(7x^6+2)$$

5. $$\frac{d^2y}{dx^2} = 18x^{-4} + \frac{2}{3} - \frac{2}{9}x^{-4/3}$$

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

$$f''(x) = \frac{(4x^3+6x)(x^2+1)^2 - 2(x^2+1)2x(x^4+3x^2)}{(x^2+1)^4}$$

6. (a) $y - 2 = \frac{1}{4}(x-4)$

(b) $y + 2 = 3(x-3)$

7. (a) $x(0) = 6$ ft.

(b) $x'(5) = -5$ ft/sec.

(c) $\dfrac{x(5)-x(0)}{5-0} = -15$ ft/sec.

8. (a) $R(x) = x(150-x)$ or $R(p) = p(150-p)$

(b) $P(x) = x(150-x) - (250+4x)$ or $P(p) = p(150-p) - (250+4(150-p))$

(c) $P'(x) = 146 - 2x$ or $P'(p) = 154 - 2p$

(d) $p = 77$

9. Slope of tangent line is $f'(x_0) = \dfrac{-x_0}{\sqrt{9-(x_0)^2}} = \dfrac{-x_0}{y_0}$

Slope of line through points $(0,0)$ and $(x_0, y_0) = \dfrac{y_0}{x_0}$

Slopes of the two lines are negative reciprocals, so the lines must be perpendicular.