

Key II - D

$$1. f'(x) = \lim_{h \rightarrow 0} \frac{(2(x+h)^2 - 5(x+h)) - (2x^2 - 5x)}{h} = \lim_{h \rightarrow 0} \frac{\cancel{2x^2} + 4xh + \cancel{2h^2} - \cancel{5x} - 5h - \cancel{2x^2} + \cancel{5x}}{h}$$

$$= \lim_{h \rightarrow 0} \frac{\cancel{h} (4x + 2h - 5)}{\cancel{h}} = 4x - 5$$

$$2. a'(x) = -24x^2 + 7x^{3/4} + \frac{15}{x^6} \quad b'(x) = \frac{(x^2+4x)^2 - (2x-3)(2x+4)}{(x^2+4x)^2}$$

$$c'(x) = -3(x(-3)e^{-3x} + e^{-3x}) + 3e^{-3x} = \frac{-2x^2 + 6x + 12}{(x^2+4x)^2}$$

$$= 9xe^{-3x}$$

$$d'(x) = \frac{2x}{\sqrt{1-x^4}} - \cos(x^2) 2x \quad e'(x) = \frac{1}{2} \frac{1}{x^2-x} (2x-1)$$

$$3. f'(x) = x^2 (\cos 3x)^3 + 2x \sin 3x$$

$$f''(x) = x^2 (-\sin 3x)^3 \cdot 3 + 2x (\cos 3x)^3$$

$$+ 2x (\cos 3x)^3 + 2 \sin 3x$$

$$= -9x^2 \sin 3x + 12x \cos 3x + 2 \sin 3x$$

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

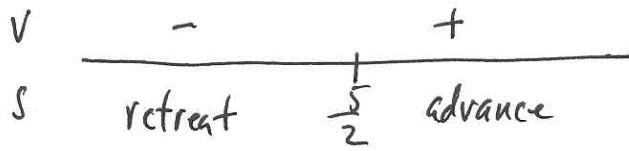
$$y-4 = \frac{7}{4}(x-3)$$

$$m = 2 - \frac{1}{4} = \frac{7}{4}$$

$$P = (3, 4)$$

Key II-D

5. $v(t) = 4t - 10$



a) $(\frac{5}{2}, 5]$

b) $[1, \frac{5}{2})$

c) $TD = |s(\frac{5}{2}) - s(1)| + |s(5) - s(\frac{5}{2})|$
 $= 4\frac{1}{2} + 12\frac{1}{2} = 17$

6. $h(t) = s_0 + v_0 t - 16t^2$

$v(t) = v_0 - 32t$

@ $t = 3$ $v(t) = 0 \Rightarrow v_0 = 96$

@ $t = 12$ $h(t) = 0 \Rightarrow s_0 = 1152$

@ $t = 3$ $h(t) = \max$

a) 96

b) 1152

c) 1296

d) -288

7. $3x^2 - 3(xy' + y) - 3y^2 y' = 0$

$3x^2 - 3y = 3xy' + 3y^2 y' = (3x + 3y^2)y'$

$y' = \frac{3x^2 - 3y}{3x + 3y^2} = \frac{x^2 - y}{x + y^2}$

8. $2x + 3(2yy') = 5$

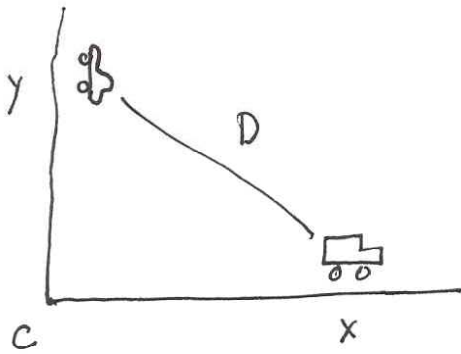
$y' = \frac{5 - 2x}{6y}$

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

$m = \frac{1}{6}$

Key II - D

9.



x = distance truck to C
 y = distance car to C
 D = distance truck to car

$$\frac{dx}{dt} = 60 \quad \frac{dy}{dt} = 75 \quad \frac{dD}{dt} = ?$$

$$D^2 = x^2 + y^2$$

$$\cancel{2}D \frac{dD}{dt} = \cancel{2}x \frac{dx}{dt} + \cancel{2}y \frac{dy}{dt}$$

$$\frac{dD}{dt} = \frac{x \frac{dx}{dt} + y \frac{dy}{dt}}{D}$$

$$\text{@ } 1^{\text{oo}} \quad x = 300$$

$$\text{@ } 1^{\text{oo}} \quad y = 300$$

$$\text{@ } 1^{\text{oo}} \quad D = 300\sqrt{2}$$

$$\frac{dD}{dt} = \frac{300(60) + 300(75)}{300\sqrt{2}} = \frac{135}{\sqrt{2}} \approx 95.46$$