

Key II - B

$$1. f'(x) = \lim_{h \rightarrow 0} \frac{(2(x+h)^2 - 3(x+h)) - (2x^2 - 3x)}{h} = \lim_{h \rightarrow 0} \frac{\cancel{2x^2} + 4xh + \cancel{2h^2} - \cancel{3x} - 3h - \cancel{2x^2} + \cancel{3x}}{h}$$

$$= \lim_{h \rightarrow 0} \frac{\cancel{h}(4x + 2h - 3)}{\cancel{h}} = 4x - 3$$

$$2. a'(x) = -24x^3 - 5x^{\frac{1}{4}} - \frac{60}{x^6} \quad \left. \begin{array}{l} b'(x) = \frac{(x^2+4x)^3 - (3x-2)(2x+4)}{(x^2+4x)^2} \\ c'(x) = -5(x(-5)e^{-5x} + e^{-5x}) + 5e^{-5x} \\ = 25xe^{-5x} \end{array} \right\} = \frac{-3x^2 + 4x + 8}{(x^2+4x)^2}$$

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

$$= \frac{x-1}{x^2-2x}$$

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

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

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

$$= -4x^2 \sin 2x + 8x \cos 2x + 2 \sin 2x$$

$$4. f'(x) = 2 - \frac{1}{2\sqrt{x+5}}$$

$$m = 2 - \frac{1}{6} = \frac{11}{6}$$

$$p = (4, 5)$$

$$y - 5 = \frac{11}{6}(x - 4)$$

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

v
 s

$\frac{+}{\text{advance}}$

$\frac{|}{\frac{5}{2}}$

$\frac{-}{\text{retreat}}$

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

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

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

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

$v(t) = v_0 - 32t$

@ $t = 2$ $v(t) = 0 \Rightarrow v_0 = 64$

@ $t = 8$ $h(t) = \Rightarrow s_0 = 512$

@ $t = 2$ $h(t) = \text{max}$

a) 64

b) 512

c) 576

d) -192

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

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

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

8. $4x + 2y y' = 4y'$

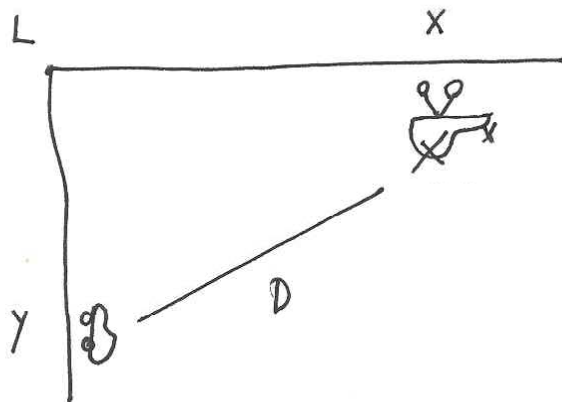
$\frac{4x}{4 - 2y} = y'$

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

$y - 3 = -2(x - 1)$

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9.



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

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

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

$$\frac{dD}{dt} = \frac{30(-60) + 30(-50)}{30\sqrt{2}} = \frac{-110}{\sqrt{2}} \approx -77.78$$

x = distance heli to L

y = distance car to L

D = distance heli to car

$$\frac{dx}{dt} = -60 \quad \frac{dy}{dt} = -50 \quad \frac{dD}{dt} = ?$$

@ 3⁰⁰ $x = 30$

@ 3⁰⁰ $y = 30$

@ 3⁰⁰ $D = 30\sqrt{2}$