Key II - C

1. $f'(x) = \lim_{h\to 0} \frac{\left(3(x+h)^2 - 7(x+h)\right) - \left(3x^2 - 7x\right)}{h} = \lim_{h\to 0} \frac{3x^2+6xh+3h^2-7x-7h-3x^2+7x}{h}$

$= \lim_{h\to 0} \frac{h(6x+3h-7)}{h} = 6x-7$

2. $a'(x) = 14x - \frac{20}{3}x^{2/3} + \frac{8}{x^5}$

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

$= \frac{-3x^2+6x+6}{(x^2+2x)^2}$

$c'(x) = -2\left(x(-2)e^{-2x} + e^{-2x}\right) + 2e^{-2x}$

$= 4xe^{-2x}$

$d'(x) = \frac{2x}{1+x^4} - \sec^2(x^2)\,2x$

$e'(x) = \frac{1}{2}\frac{1}{x^2+x}(2x+1)$

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

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

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

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

4. $f'(x) = \frac{1}{2\sqrt{x+7}} - 4$

$m = \frac{1}{6} - 4 = \frac{-23}{6}$

$P = (2,-5)$

$y+5 = \frac{-23}{6}(x-2)$

Key II-C

5. $v(t) = 4t - 6$

v	−	+
s	retreat	$\frac{3}{2}$ advance

a) $(\frac{3}{2}, 4]$

b) $[0, \frac{3}{2})$

c) $TD = |s(\frac{3}{2}) - s(0)| + |s(4) - s(\frac{3}{2})|$

$= 4\frac{1}{2} + 12\frac{1}{2} = 17$

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

$v(t) = v_0 - 32t$

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

@ $t = 11$ $h(t) = 0 \Rightarrow s_0 = 880$

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

a) 96
b) 880
c) 1024
d) −256

7. $3x^2 - 4(xy' + y) - 3y^2 y' = 0$

$3x^2 - 4y = 4xy' + 3y^2 y' = (4x + 3y^2)y'$

$y' = \frac{3x^2 - 4y}{4x + 3y^2}$

8. $4x + 2yy' = 5y'$

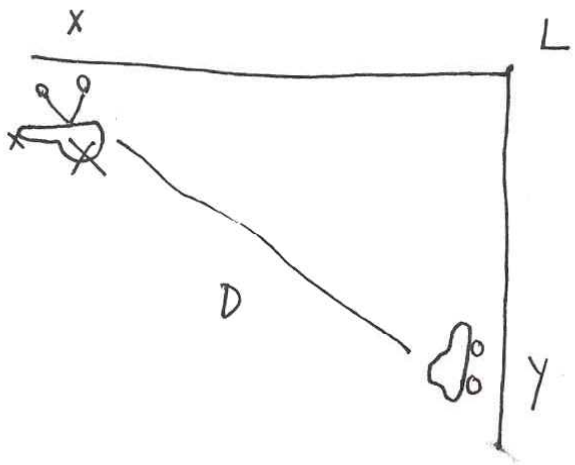
$\frac{4x}{5 - 2y} = y'$

$m = \frac{4}{1} = 4$

$y - 2 = 4(x - 1)$

Key II-C

9.



x = distance heli to L

y = distance car to L

D = distance heli to car

$\frac{dx}{dt} = -40 \quad \frac{dy}{dt} = -60 \quad \frac{dD}{dt} = ?$

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

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

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

@ 5^{00} $x = 40$

@ 5^{00} $y = 40$

@ 5^{00} $D = 40\sqrt{2}$

$$\frac{dD}{dt} = \frac{40(-40) + 40(-60)}{40\sqrt{2}} = \frac{-100}{\sqrt{2}} \approx -70.71$$