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### Assignment 2

1)  $f = x^2 i + (3x+2) j + \sin x k$

a)  $\frac{df}{dx} = 2xi + 3j + \cos x k$

b)  $\frac{d^2 f}{dx^2} = 2i - \sin x k$

c)  $\left| \frac{df}{dx} \right| = \sqrt{2^2 + 3^2 + 1^2} = \sqrt{14}$

d)  $f \cdot f = [x^2 i + (3x+2) j + \sin x k] \cdot [x^2 i + (3x+2) j + \sin x k]$   
 $f \cdot f = x^4 + (3x+2)^2 + \sin^2 x$  [i.i=j.j=k.k=1]

$\frac{d(f \cdot f)}{dx} = 4x^3 + 2(3)(3x+2) + 2 \cos x$   
at  $x=1$   
 $= 4 + 4(5) + 2(1) = 36$

2)  $r = (t^2 + 3t) i - 2 \sin 3t j + 3e^{3t} k$

a)  $\frac{dr}{dt} = (2t + 3) i - 6 \cos 3t j + 9e^{3t} k$

b)  $\frac{d^2 r}{dt^2} = 2i + 18 \sin 3t j + 27e^{3t} k$

c) at  $t=0$ ;  
 $= 2i + 0 + 27k$

$\left| \frac{d^2 r}{dt^2} \right| = \sqrt{2^2 + 27^2} = 27.07$