

ASSIGNMENT 2  
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 ELECTRICAL ELECTRONICS ENGINEERING.  
 ENG 282

(1)  $F = x^2 \hat{i} + (3x+2) \hat{j} + \sin x \hat{k}$

(a)  $\frac{dF}{dx} = 2x \hat{i} + 3 \hat{j} + \cos x \hat{k}$

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

(c)  $\left| \frac{dF}{dx} \right| = \sqrt{2^2 + 3^2 + 1^2}$   
 $= \sqrt{13}$

i.e at  $x=1$   $\left| \frac{dF}{dx} \right| = 2 \hat{i} + 3 \hat{j} + \hat{k}$

(d)  $F \cdot F = [x^2 \hat{i} + (3x+2) \hat{j} + \sin x \hat{k}] \cdot [x^2 \hat{i} + (3x+2) \hat{j} + \sin x \hat{k}]$   
 $F \cdot F = x^4 + (3x+2)^2 + \sin^2 x$  ( $\hat{i} \cdot \hat{i} = 1, \hat{j} \cdot \hat{j} = 1, \hat{k} \cdot \hat{k} = 1$ )

$\frac{d(F \cdot F)}{dx} = 4x^3 + 2(3) \cdot (3x+2) + 2 \cos x$

at  $x=1$   $4 + 4(5) + 2 = 36$

$\frac{d(F \cdot F)}{dx} = 36$

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

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

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

(c) at  $t=0$   
 $= 2 \hat{i} + 27 \hat{k}$

$\sqrt{2^2 + 27^2}$

$= 27.07$