

17/ENG02/039

Jude - Shima Favours

Computer Eng

ENG 282 (Assignment II)

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

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

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

c)  $\left| \frac{dF}{dx} \right|_{at 1} = 2(1)i + 3j + \cos(1)k$   
 $2i + 3j + 0.999k$   
 $= \sqrt{2^2 + 3^2 + (0.999)^2}$   
 $= \sqrt{13.998} = 3.74$

d.  $\frac{d}{dx} (CF) =$

$(CF) = (x^2 i + (3x+2)j + \sin x k) \cdot (x^2 i + (3x+2)j + \sin x k)$   
 $= x^4 + 9x^2 + 12x + 4 + \sin^2 x$

$\frac{d(\sin^2 x)}{dx} = \sin^2 x = \sin x = \sin x$

$u = \sin x, v = \sin x$

$\frac{du}{dx} = \cos x, \frac{dv}{dx} = \cos x$

using product rule.

$u \frac{dv}{dx} + v \frac{du}{dx}$

$= \sin(\cos x) + \sin(\cos x)$

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

$\frac{d}{dx} \sin^2 x = 2 \sin x \cos x$

$\frac{d(CF \cdot F)}{dx} = 4x^3 + 18x + 12 + 2 \sin x \cos x$   
at  $x = 1$

$4(1) + 18(1) + 12 + 2 \sin(1) \cos(1)$

$4 + 18 + 12 + 0.03484$

$= 34.03$

$$2 \quad \text{If } r = (t^2 + 3t)i - 2\sin 3tj + 3e^{2t}k$$

$$\frac{d \cdot r}{dt} = (2t + 3)i - 6\cos 3tj + 6e^{2t}k.$$

$$\frac{d^2 r}{dt^2} = 2i + 18\sin 3tj + 12e^{2t}k.$$

at 0

$$2i + 18\sin(3 \times 0)j + 12e^{2(0)}k$$

$$2i + 0 + 12k$$

$$\left| \frac{d^2 r}{dt^2} \right| = \frac{\sqrt{2^2 + 12}}{\sqrt{148}}$$

$$= 12.165 \dots$$