

EJ40NEATSE TOSAM DORCAS
 171ENG061029
 MECHANICAL ENGINEERING
 ASSIGNMENT 2.

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

a) $\frac{\partial F}{\partial x} = 2x i + 3 j + \cos x k$.

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

c) $\left| \frac{\partial F}{\partial x} \right| = \sqrt{2^2 + 3^2 + 1^2}$
 $= \sqrt{13}$ i.e. at $x = \left| \frac{\partial F}{\partial x} \right| = 2i + 3j + k$

d) $F \cdot F = [x^2 i + (3x + 2) j + \sin x k] \cdot [x^2 i + (3x + 2) j + \sin x k]$

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

$\frac{\partial (F \cdot F)}{\partial x} = 4x^3 + 2(3)(3x + 2) + 2 \cos x$
 at $x = 1$

$= 4 + 4(6) + 2(1) = 36$

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

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

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

c) at $t = 0$.

$= 2i + 0 + 27k$.

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