

Name: Adebayo Caleb
 Department: Mechatronics
 Matric No: 17/ENAO5/001.
 Course Code: ENG 282

1. $F = n^2 i + (3nt+2)j + 5\sin n k$

a. $\frac{dF}{dn} = 2ni + 3j + \cos n k$

b. $\frac{d^2 F}{dn^2} = 2i - \sin n k$

c. $\left| \frac{dF}{dn} \right| = \sqrt{2^2 + 3^2 + 1}$
 $= \sqrt{13}$

at $n=2$ $\left| \frac{dF}{dn} \right| = 2i + 3j + k$

d. $F \cdot F = (n^2 i + (3nt+2)j + 5\sin n k) \cdot (n^2 i + (3nt+2)j + 5\sin n k)$
 $= n^4 + (3nt+2)^2 + 5^2 \sin^2 n$ ($i \cdot i = j \cdot j = k \cdot k = 1$)

$\frac{d(F \cdot F)}{dn} = 4n^3 + 2(3)(3nt+2) + 2 \cos n$

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

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

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

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

c. at $t=0$

$\frac{d^2 r}{dt^2} = 2i + 0 + 27k$

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