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DEPARTMENT: COMPUTER ENGINEERING

COURSE: MAT 102

MATRIC NO: 19/Eng02/011

ASSIGNMENT

1) $x=t, y=t^2, z=t^3$.

$$r = xi + yj + zk$$

$$r = ti + t^2j + t^3k$$

$$\frac{dr}{dt} = \frac{d}{dt}(t) + \frac{d}{dt}(t^2) + \frac{d}{dt}(t^3)$$

$$= 1i + 2tj + 3t^2k$$

$$\text{at } t=1 = 1i + 2(1)j + 3(1)k$$

$$\frac{dr}{dt} = 1i + 2j + 3k$$

$$\left| \frac{dr}{dt} \right| = \sqrt{(1)^2 + (2)^2 + (3)^2} = \sqrt{1+4+9}$$

$$= \sqrt{14}$$

$$T = \frac{\frac{dr}{dt}}{\left| \frac{dr}{dt} \right|}$$

$$T = \frac{1i + 2j + 3k}{\sqrt{14}}$$

2) $A = 4t^3j + 5k$ and $B = \cancel{2t^2j} + 2ti + 4tj$, $G = A \times B$.

$$G = A \times B = \begin{vmatrix} i & j & k \\ 0 & 4t^3 & 5 \\ 2t^2 & 4t & 0 \end{vmatrix}$$

$$i \begin{vmatrix} 4t^3 & 5 \\ 4t & 0 \end{vmatrix} - j \begin{vmatrix} 0 & 5 \\ 2t^2 & 0 \end{vmatrix} + k \begin{vmatrix} 0 & 4t^3 \\ 2t^2 & 4t \end{vmatrix}$$

$$i[0 - 20t] - j[0 - 10t^2] + k[0 - 8t^5]$$

$$G = -20ti + 10t^2j - 8t^5k$$

$$\int_0^1 G = \int_0^1 (-20ti + 10t^2j - 8t^5k) dt$$

$$\begin{aligned} &= \left[\frac{-20t^2}{2} i + \frac{10t^3}{3} j - \frac{8t^6}{6} k \right]_0^1 \\ &= \left[\frac{-20(1)^2}{2} i + \frac{10(1)^3}{3} j - \frac{8(1)^6}{6} k \right] - \left[\frac{-20(0)^2}{2} i + \frac{10(0)^3}{3} j - \frac{8(0)^6}{6} k \right] \\ &= \left[-10i + \frac{10}{3} j - \frac{4}{3} k \right] - [0] \\ &= -10i + \frac{10}{3} j - \frac{4}{3} k // \end{aligned}$$