

AFINIKI JOHN MHYA
 COMPUTER ENGINEERING
 19/ENG02/028
 MAT 102

ASSIGNMENT

1 Find the unit vector tangent to the space Curve $x=t$, $y=t^2$, $z=t^3$ at the point where $t=1$

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

$$\frac{dr}{dt} = i + 2tj + 3t^2k$$

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

$$\left| \frac{dr}{dt} \right| \text{ at } t=1 = \sqrt{1^2 + 2^2 + 3^2}$$

$$= \sqrt{14}$$

$$\approx 3.742$$

$$\therefore \frac{\frac{dr}{dt}}{\left| \frac{dr}{dt} \right|} = \frac{i + 2j + 3k}{\sqrt{14}}$$

2 Given that $A = 4t^3j + 5k$, $B = 2t^2i + 4tj$, $G = A \times B$. Find the integral of G from 0 to 1

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

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

$$G = -20ti + 10t^2j - 8t^6k$$

$$\int_0^1 G \, dtz = -i \int 20t + j \int 10t^2 - k \int 8t^6$$

$$-i \left(10t^2 \Big|_0^1 \right) + j \left(\frac{10}{3} t^3 \Big|_0^1 \right) - k \left(\frac{4}{3} t^6 \Big|_0^1 \right)$$
$$-i (10 - 0) + j \left(\frac{10}{3} - 0 \right) - k \left(\frac{4}{3} - 0 \right)$$

$$\therefore \int_0^1 G \, dtz = 10i + \frac{10}{3}j - \frac{4}{3}k$$