JOHN-UBOLI NNEOMA ENDURA.
COMPUTER ENGINEERING
18/ENG02/052 (CARRY OVER)

MAT 102

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

$$\hat{r} = t\hat{i} + t^2\hat{j} + t^3\hat{k}$$

$$T = \frac{dr/dt}{|dr/dt|}$$

$$\therefore \frac{dr}{dt} = \hat{i} + 2t\hat{j} + 3t^2\hat{k}$$

at $t = 1$

$$\therefore 2(1)\hat{j} + 3(1)^2\hat{k}$$

$$\left.\frac{dr}{dt}\right|_{t=1} = \hat{i} + 2\hat{j} + 3\hat{k}$$

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

$$= \sqrt{14}$$

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

2. Given that $A = 4t^3\hat{j} + 5\hat{k}$

$$B = 2t^2\hat{i} + t\hat{j}$$

If $G = A \times B$. Find the integral of G from $(0 \to 1)$

$$\int_0^1 (A \times B)\,dt \quad \text{or} \quad \int_0^1 G\,dt$$

$$\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 4t^3 & 5 \\ 2t^2 & t & 0 \end{vmatrix} = 5\hat{i}\left|0 - 20t\right|_0^1 - \hat{j}\left|0 - (2t^2 \times 5)\right|_0^1 + \hat{k}\left|0 - (2t^2 \times 4t^3)\right|_0^1$$

$$= -20t^2\hat{i} - 10t\hat{j} + 8t^5\hat{k}$$

$$= -20\hat{i} - 10\hat{j} - 8\hat{k}$$