

PINNICK ITSE ORITSETSERUNDEDE

CHEMICAL ENGINEERING

19/ENGG01/013

SERIAL NUMBER : 48

MAT 102 ASSIGNMENT

Question 1

Find the Unit vector tangent to the Space curve $x = t$, $y = t^2$, $z = t^3$ at the point where $t = 1$

Solution

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

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

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

$$\left| \frac{dr}{dt} \right|_{t=1} = \sqrt{1^2 + 2^2 + 3^2} = \sqrt{1+4+9} = \sqrt{14}$$

$$\text{Unit Vector tangent} = \frac{dr/dt}{|dr/dt|} = \frac{i + 2j + 3k}{\sqrt{14}}$$

Question 2

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

Solution

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

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

$$i(0 - 20t) - j(0 - 10t^2) + k(0 - 8t^5)$$

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

$$\int_0^1 G dt = -i \int 20t + j \int 10t^2 - k \int 8t^5$$

$$-i(10t^2|_0^1) + j(10/3 t^3|_0^1) - k(4/3 t^6|_0^1)$$

$$-i(10 - 0) + j(10/3 - 0) - k(4/3 - 0)$$

$$\therefore \int_0^1 G dt = -10i + 10/3j - 4/3k$$