

NAME  
COURSE  
DEPT  
MATRICNO

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MAT 102  
COMPUTER ENGINEERING  
19/ENG02005

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

$$r = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$$

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

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

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$$\left| \frac{dr}{dt} \right| = \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2 + \left(\frac{dz}{dt}\right)^2} = \sqrt{(1)^2 + (2)^2 + (3)^2} = \sqrt{14}$$

$$\therefore \hat{T}(t) = \frac{\left(\frac{dr}{dt}\right)}{\left| \frac{dr}{dt} \right|} = \frac{\mathbf{i} + 2t\mathbf{j} + 3t^2\mathbf{k}}{\sqrt{14}}$$

$$\therefore \text{unit Tangent at } t=1 \quad \hat{T}(1) = \frac{\mathbf{i} + 2(1)\mathbf{j} + 3(1)^2\mathbf{k}}{\sqrt{14}} = \frac{\mathbf{i} + 2\mathbf{j} + 3\mathbf{k}}{\sqrt{14}}$$

(2)  $\vec{A} = 4t^3\mathbf{j} + 5t\mathbf{k}$     $\vec{B} = 2t^2\mathbf{i} + t\mathbf{k}$

$$\vec{C} = \vec{A} \times \vec{B} = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ 0 & 4 & 5 \\ 2 & 4 & 0 \end{vmatrix}$$

$$\vec{C} = \mathbf{i}(0-20) - \mathbf{j}(0-10) + \mathbf{k}(0-8)$$
$$= 20\mathbf{i} + 10\mathbf{j} - 8\mathbf{k}$$

$$\int_0^1 (2t) dt = -20t\mathbf{i} + 10t\mathbf{j} - 8t\mathbf{k} + \mathbf{c}$$

$$\int_0^1 (2t) dt = \left[ -20t + 10t - 8t \right]_0^1$$

$$= \left[ -20(1) + 10(1) - 8(1) \right] - \left[ -20(0) + 10(0) - 8(0) \right]$$

$$= -13 - 10$$

$$\mathbf{c} = -13\mathbf{j} \text{ units}$$