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Department: COMPUTER ENGINEERING

Course: MFI 102

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Assignment

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

$$r = xi + yj + zk$$

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

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

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

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

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

∴ Unit Tangent at ~~t=1~~ $\hat{T}(1) = \frac{i + 2(1)j + 3(1)^2k}{\sqrt{14}} = \frac{i + 2j + 3k}{\sqrt{14}}$

2) $A = 4tj + 5k, \bar{B} = 2t^2j + 4tj$

$$G = \bar{A} \times \bar{B} = \begin{vmatrix} i & j & k \\ 0 & 4 & 5 \\ 2 & 4 & 0 \end{vmatrix} = i \begin{vmatrix} 4 & 5 \\ 4 & 0 \end{vmatrix} - j \begin{vmatrix} 0 & 5 \\ 2 & 0 \end{vmatrix} + k \begin{vmatrix} 0 & 4 \\ 2 & 4 \end{vmatrix}$$

$$G = i[(4 \times 0) - (5 \times 4)] - j[(0 \times 0) - (5 \times 2)] + k[(0 \times 4) - (4 \times 2)]$$

$$G = i(0 - 20) - j(0 - 10) + k(0 - 8)$$

$$G = -20i + 10j - 8k$$

$$\therefore \int G(t) dt = -20ti + 10tj - 8tk + C$$

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$$\begin{aligned}\int_0^1 f(t) dt &= [-20t + 10t - 3t^2]_0^1 \\ &= [-20(1) + 10(1) - 3(1)] - [-20(0) + 10(0) - 3(0)] \\ &= -13 - 0 \\ &= \underline{\underline{-13 \text{ Square units}}}\end{aligned}$$