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MATRIC NO: 19/ENG02/036
COURSE CODE: MAT 102

01. $x = t, \quad y = t^2, \quad z = t^3$

$r = xi + yj + zk$

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

$dr/dt = 1i + 2tj + 3t^2 k$

$dr/dt = i + 2tj + 3t^2 k$

$dr/dt = i + 2tj + 3t^2 k$

$$|dr/dt| = \sqrt{(dx/dt)^2 + (dy/dt)^2 + (dz/dt)^2}$$

$$= \sqrt{(1)^2 + (2)^2 + (3)^2}$$

$$= \sqrt{14}$$

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

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

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

02. $\bar{A} = 4t^3 j + 5k \qquad \bar{B} = 2t^2 + 4t$

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

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

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

$\therefore \int G(t)\,dt = -20ti + 10tj + 30k + C$

$$\int_0^1 G(t)\,dt = \left[-20t + 10t - 3t\right]_0^1$$

$= [-20(1) + 10(1) - 30] - [-20(0) + 10(0) - 3(0)]$

$= -13 - 0$

$= -13$ sq units