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DEP: COMPUTER ENGINEERING

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COURSE: MAT 102

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

$r = xi + yj + zk$

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

$\frac{dr}{dt} = 1i + 2tj + 3t^2 k.$

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

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

$\therefore T(t) = \frac{\left(\frac{dr}{dt}\right)}{\left|\frac{dr}{dt}\right|} = \frac{1 + 2ti + 3t^2 k}{\sqrt{14}}$

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

$= \frac{1 + 2j + 3k}{\sqrt{14}}$

2 $A = 4t^3 j + 5k \quad B = 2t^2 i + 4t$

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

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

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

$$\int G(t)\,dt = -20t_i + 10t_j - 3t_k + C$$

$$\int_0^1 G(t)\,dt = \left[-20t\,\hat{i} + 10t\,\hat{j} - 3t\,\hat{k}\right]_0^1$$

$$= \left[-20(1) + 10(1) - 3(1)\right] - \left[-20(0) + 10(0) - 3(0)\right]$$

$$= -13 - 0$$

$$= -13 \text{ sq units.}$$