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

$r = xi + yj + zk$

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

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

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

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

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

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

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

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

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

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

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

$\therefore \int G(t)\,dt = -20ti + 10tj - 3tk + C$

$$\cancel{\int_0^1 G(t)\,dt = -20ti}$$

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

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

$$= -13 - 0$$

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