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 MATRIC NO: 19/ENG04/015 SERIAL NUMBER: 19
 MATHEMATICS ASSIGNMENT

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

$T = \frac{dx}{dt} \hat{i} + \frac{dy}{dt} \hat{j} + \frac{dz}{dt} \hat{k}$

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

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

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

$\frac{dr}{dt}$ at $t=1 = \hat{i} + 2\hat{j} + 3\hat{k}$

$|\frac{dr}{dt}| = \sqrt{1^2 + 2^2 + 3^2} = \sqrt{1+4+9} = \sqrt{14}$

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

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

$G = A \times B = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 4t^3 & 5 \\ 2t^2 & 4t & 0 \end{vmatrix} = \hat{i}(4t^3 \cdot 0 - 20t) - \hat{j}(0 - 10t^2) + \hat{k}(0 - 8t^5)$

$\int G = \int_0^1 (-20t\hat{i} + 10t^2\hat{j} - 8t^5\hat{k}) dt$
 $= \left[-\frac{20t^2}{2}\hat{i} + \frac{10t^3}{3}\hat{j} - \frac{8t^6}{6}\hat{k} \right]_0^1$

$= \left[-\frac{20(1)^2}{2}\hat{i} + \frac{10(1)^3}{3}\hat{j} - \frac{8(1)^6}{6}\hat{k} \right] - \left[-\frac{20(0)^2}{2}\hat{i} + \frac{10(0)^3}{3}\hat{j} - \frac{8(0)^6}{6}\hat{k} \right]$

$= -10\hat{i} + \frac{10}{3}\hat{j} - \frac{4}{3}\hat{k}$