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 19/Eng 02/045
 Math 702

1) $x = t$

$y = t^2$

$z = t^3$

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

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

When $t = 1$

$\left| \frac{dr}{dt} \right| = i + 2j + 3k$

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

$= \sqrt{1+4+9}$

$= \sqrt{14}$

$= 3.74$

$T = \frac{dr/dt}{|dr/dt|}$

$= \frac{i + 2j + 3k}{3.74}$

$= \frac{i}{3.74} + \frac{2j}{3.74} + \frac{3k}{3.74}$

$= \frac{i}{3.74} + \frac{2j}{3.74} + \frac{3k}{3.74}$

2) $A = 4t^3j + 5k$

$B = 2t^2i + 4tj$

$G = A \times B$

$G = \begin{vmatrix} i & 5k \\ 0 & 4t^3 \\ 2t^2 & 4t \end{vmatrix}$

$G = i \begin{vmatrix} 4t^3 & 5 \\ 4 & 0 \end{vmatrix} - 5 \begin{vmatrix} 0 & 5 \\ 2t^2 & 6 \end{vmatrix} + k \begin{vmatrix} 0 & 4t^3 \\ 2t^2 & 4t \end{vmatrix}$

$G = i(0 - 20t) - 5(0 - 10t^2) + k(0 - 8t^3)$

$$G = -20t\mathbf{i} + 10t^2\mathbf{j} - 8t^3\mathbf{k}$$

$$\int G dt = \int (-20t\mathbf{i} + 10t^2\mathbf{j} - 8t^3\mathbf{k}) dt$$

$$= \left[\frac{-20t^2}{2}\mathbf{i} + \frac{10t^3}{3}\mathbf{j} - \frac{8t^4}{4}\mathbf{k} \right]_0^1$$

$$= \left[-10t^2\mathbf{i} + \frac{10t^3}{3}\mathbf{j} - 2t^4\mathbf{k} \right]_0^1$$

$$= \left[-10(1)^2\mathbf{i} + \frac{10(1)^3}{3}\mathbf{j} - 2(1)^4\mathbf{k} \right] - [0]$$

$$= -10\mathbf{i} + \frac{10}{3}\mathbf{j} - 2\mathbf{k}$$

$$= -10\mathbf{i} + 3.33\mathbf{j} - 2\mathbf{k}$$