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M/ENG.04/004 MAT 102 Serial No: 12

(1) $E = xi + yj + zk$

$x = t \; ; \; y = t^2 \; ; \; z = t^3$

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

$E = (1)i + (1)^2j + (1)^3k$

$E = i + j + k$

$dr/dt = i + j + k$

$|dr/dt| = \sqrt{1^2 + 1^2 + 1^2} = \sqrt{1+1+1} = \sqrt{3}$

$T = \frac{dr/dt}{|dr/dt|} \; ; \; T = \frac{i+j+k}{\sqrt{3}}$

(2.) $A \times B = \begin{vmatrix} i & j & k \\ 0 & 4t^3 & 5 \\ 2t^2 & 4t & 0 \end{vmatrix}$

$i[(4t^3 \times 0) - (5 * 4t)] - j[(0 \times 0) - (5 \times 2t^2)] + k[(0 \times 4t) - (4t^3 \times 2t^2)]$

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

$\int_0^1 -20t\,i + 10t^2 j - 8t^5 k$

$- \left| \frac{20t^2}{2} i - \frac{10t^3}{3} j + \frac{8t^5}{5} dt \right|_0^1$

$-\frac{20}{2}i + \frac{10}{3}j - \frac{8}{5}k$

$= -10i + 10/3\,j - 8/5\,k$