ETTANCA, BASSEY ETTANCA
19/SC101041 — COMPUTER SCIENCE

① A particle moves along a curve $x = 7t^2$, $y = 6t^2 - 4t$, $z = t - 5$, where t is time. find its Velocity

Position Vector $r = xi + yj + zk$

Thus $r = (7t^2)i + (6t^2 - 4t)j + (t-5)k$

Velocity $= dr/dt = (14t)i + (12t - 4)j + k$

② if $A = i + 2j - 4k$, $B = 2i - 3j + k$, $C = 4j - 3k$ find $A \times (B \times C)$

$$\bar{B} \times \bar{C} = \begin{vmatrix} i & j & k \\ 2 & -3 & 1 \\ 0 & 4 & -3 \end{vmatrix}$$

$= i(9-4) - j(-6-0) + k(8+0)$

$= 5i + 6j + 8k$

$$A \times (B \times C) = \begin{vmatrix} i & j & k \\ 1 & 2 & -4 \\ 5 & 6 & 8 \end{vmatrix}$$

$= i(16+24) - j(8-10) + k(6-10)$

$= 40i + 2j - 4k.$

③ Given $R = 4\sin 3t\,i + 4e^{3t}j + 7t^3k$, find the Integral of R with respect to t

$R = 4\sin 3t\,i + 4e^{3t}j + 7t^3k$

$\int R\,dt = -4/3\cos 3t\,i + 4/3\,e^{3t}j + 7t^{3+1}/3+1\,k$

$\int R\,dt = -4/3\cos 3t\,i + 4/3\,e^{3t}j + 7t^4/4\,k.$

(4) If $A = 7i + 2j - k$, $B = 2i + j + 4k$, $C = i + j + k$, find $(A+C)(B-A)$

$A+C = (7i + 2j - k) + (i + j + k)$

$A+C = (7i + i) + (2j + j) + (-k + k)$

$A+C = 8i + 3j + k$

$B - A = (2i + j + 4k) - (7i + 2j - k)$

$B - A = (2i - 7i) + (j - 2j) + 4k - k)$

$B - A = \cancel{-5i + j} - 5i - j + 3k$

$(A+C) \cdot (B-A) = (8i + 3j) \cdot (-5i - j + 3k)$

$= -40 - 3 + 0$

$= -43$

(5) $dv/dt = i + 2tj + 3t^2k$

$dv/dt = \sqrt{1^2 + (2t)^2 + (3t)^2}$

where $t = 1$

$= \sqrt{1^2 + 2^2 + 3^2}$

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

$= \sqrt{14} = 3.742$

Hence $T = \dfrac{i + 2j + 3k}{3.742}$