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DEPT: COMPUTER SCIENCE

MATRIC NO: 19/SCI01/086

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COURSE: MAT 102 ASSIGNMENT (DR. OYELAMI)

1. Soln.

$$x = 7t^2, y = 6t^2 - 4t, z = t - 5$$

The position vector; $r = xi + yj + zk$ i.e.

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

$$\text{Velocity} = \frac{dr}{dt} = (14t)i + (12t - 4)j + k$$

2: $A = i + 2j - 4k$, $B = 2i - 3j + k$, $C = 4j - 3k$. Find

$A \times (B \times C)$.

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

$$B \times C = i [(-3 \times -3) - 4] - j [-6 - 0] + k [8 - 0]$$

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

$$= \cancel{5i + 7j + 8k} \quad 5i + 6j + 8k$$

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

$$A \times (B \times C) = i [16 - (-24)] - j [8 - (-20)] + k [6 - 10]$$

$$= i(16 + 24) - j(8 + 20) + k(6 - 10)$$

$$= 40i - 28j - 4k$$

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

$$\int R dt = \int [(4\sin 3t)i + (4e^{3t})j + (7t^3)k] dt$$

$$= i \left(\frac{-4 \cos 3t}{3} \right) + j \left(\frac{4 e^{3t}}{3} \right) + k \left(\frac{7t^4}{4} \right)$$

$$4. A = 7i + 2j - k, B = 2i + j + 4k, C = i + j + k$$

$$\text{Find: } (A+C) \cdot (B-A)$$

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

$$= 8i + 3j$$

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

$$= -5i - j + 5k$$

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

$$= -40 - 3$$

$$= -43$$

$$5. \cancel{y=t^2} \quad x=t, y=t^2, z=t^3 \text{ at the point, } t=1$$

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

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

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

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

$$\text{where } t=1$$

$$= \sqrt{1^2 + 2^2 + 3^2} = \sqrt{1 + 4 + 9} = \sqrt{14} = 3.74$$

$$\text{Hence, } T = \frac{i + 2j + 3k}{3.74}$$