

$$= -40 + (-3) = -40 - 3 = -43$$

$$5 \quad x=t, \quad y=t^2, \quad z=t^3$$

$$\text{Unit vector} = \frac{x}{|x+y+z|}, \frac{y}{|x+y+z|}, \frac{z}{|x+y+z|}$$

$$\Rightarrow |x+y+z| = t+t^2+t^3$$

$$\sqrt{t^2 + (t^2)^2 + (t^3)^2} \quad ; \quad \text{but } t=1$$

$$\Rightarrow \sqrt{(1)^2 + (1^2)^2 + (1^3)^2} = \sqrt{1} = 1$$

$$\therefore |x+y+z| = 1$$

$\Rightarrow$  unit vector tangent to the curve = 1 //

3  $R = 4\sin 3t \mathbf{i} + 4e^{3t} \mathbf{j} + 7t^3 \mathbf{k}$ ; find the integral of  $R$  with respect to  $t$ .

Soln

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

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

$$\int \sin 3t = -\frac{\cos 3t}{3}$$

$$\int e^{3t} = \frac{e^{3t}}{3}$$

$$\therefore \int 4(-\cos 3t) \mathbf{i} + \frac{4e^{3t}}{3} \mathbf{j} + \frac{7t^4}{4} \mathbf{k}$$

$$\therefore \int R = -4\cos 3t \mathbf{i} + \frac{4e^{3t}}{3} \mathbf{j} + \frac{7t^4}{4} \mathbf{k} //$$

4  $A = 7\mathbf{i} + 2\mathbf{j} - \mathbf{k}$ ,  $B = 2\mathbf{i} + \mathbf{j} + 4\mathbf{k}$ ,  $C = \mathbf{i} + \mathbf{j} + \mathbf{k}$

$$\Rightarrow (A+C) \Rightarrow (7\mathbf{i} + 2\mathbf{j} - \mathbf{k}) + (\mathbf{i} + \mathbf{j} + \mathbf{k})$$

$$= 8\mathbf{i} + 3\mathbf{j}$$

$$(B-A) \Rightarrow (2\mathbf{i} + \mathbf{j} + 4\mathbf{k}) - (7\mathbf{i} + 2\mathbf{j} - \mathbf{k})$$

$$= (2-7)\mathbf{i} + (1-2)\mathbf{j} + (4-(-1))\mathbf{k}$$

$$\Rightarrow -5\mathbf{i} - \mathbf{j} + 5\mathbf{k}$$

$$(A+C) \cdot (B-A) \Rightarrow (8\mathbf{i} + 3\mathbf{j}) \cdot (-5\mathbf{i} - \mathbf{j} + 5\mathbf{k})$$

$$\Rightarrow 8\mathbf{i} \cdot (-5\mathbf{i} - \mathbf{j} + 5\mathbf{k}) + 3\mathbf{j} \cdot (-5\mathbf{i} - \mathbf{j} + 5\mathbf{k})$$

$$+ 0(5\mathbf{i} - \mathbf{j} + 5\mathbf{k})$$

= note

$$\mathbf{i} \cdot \mathbf{i} = \mathbf{k} \cdot \mathbf{k} = \mathbf{j} \cdot \mathbf{j} = 1$$

$$\mathbf{i} \cdot \mathbf{j} = \mathbf{i} \cdot \mathbf{k} = \mathbf{j} \cdot \mathbf{k} = 0$$

$$\Rightarrow (8 \times -5) \times 1 + (3 \times -1) \times 1$$

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1 The equation of particle =  $x+y+z$   
 $\Rightarrow x+y+z = 7t^2 + (6t^2 - 4t) + (t-5)$   
 $\therefore x+y+z = 7t^2 + 6t^2 - 4t + t - 5$   
 $\Rightarrow x+y+z = 13t^2 - 3t - 5$

let  $x+y+z = A$   
 $\Rightarrow A = 13t^2 - 3t - 5$

$$\frac{dA}{dt} \text{ (velocity)} = 26t - 3 //$$

$$\therefore \text{velocity} = 26t - 3 //$$

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

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

$$\Rightarrow i[(-3 \times -3) - (1 \times 4)] - j[(2 \times -3) - (0 \times 1)] + k[(2 \times 4) - (0 \times -3)]$$

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

$$= 5i + 6j + 8k //$$

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

$$\Rightarrow i[(2 \times 8) - (-4 \times 6)] - j[(1 \times 8) - (-4 \times 5)] + k[(1 \times 6) - (2 \times 5)]$$

$$\Rightarrow 24i - 40j - 4k //$$

$$\therefore A \times (B \times C) = 24i - 40j - 4k //$$