

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

$$\text{Velocity} = \frac{dy}{dt} = 14t\mathbf{i} + (2t - 4)\mathbf{j} + \mathbf{k}$$

$$A \times (B \times C) = A = \mathbf{i} + 2\mathbf{j} - 4\mathbf{k}, \quad B = 2\mathbf{i} - 3\mathbf{j} + \mathbf{k}, \quad C = 4\mathbf{j} - 3\mathbf{k}$$

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

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

$$\mathbf{i} \begin{vmatrix} -3 & 1 \\ 4 & -3 \end{vmatrix} - \mathbf{j} \begin{vmatrix} 2 & 1 \\ 0 & -3 \end{vmatrix} + \mathbf{k} \begin{vmatrix} 2 & -3 \\ 0 & 4 \end{vmatrix}$$

$$= 5\mathbf{i} + 6\mathbf{j} + 11\mathbf{k}$$

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

$$= \begin{matrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ 1 & 2 & -4 \\ 5 & 6 & 11 \end{matrix}$$

$$\mathbf{i} \begin{vmatrix} 2 & -4 \\ 6 & 11 \end{vmatrix} - \mathbf{j} \begin{vmatrix} 1 & -4 \\ 5 & 11 \end{vmatrix} + \mathbf{k} \begin{vmatrix} 1 & 2 \\ 5 & 6 \end{vmatrix}$$

$$= 46\mathbf{i} - 31\mathbf{j} - \mathbf{k}$$

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

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

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

$$A = 7i + 2j - k$$

$$B = 2i + j + 4k$$

$$C = i + j + k$$

Find $(A+C) \cdot (B-A)$

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

$$(A+C) \cdot (B-A) = \begin{matrix} i & j & k \\ 8 & 3 & 0 \\ -5 & -1 & 5 \end{matrix}$$

i	3	0	$-j$	8	0	$+k$	8	3
	-1	5		-5	5		-3	-1

$$= 15i - 40j + 7k$$

19/SCI01/053

$$x = t, y = t^2, z = t^3$$

differentiate $= (1, 2t, 3t^2)$

$$\therefore \vec{r}'(t) = (1, 2t, 3t^2)$$

Divide the vector by its magnitude

$$\text{Magnitude } \|\vec{r}'(t)\| = \sqrt{(1)^2 + (2t)^2 + (3t^2)^2}$$
$$= \sqrt{1 + 4t^2 + 6t^4}$$

$$T(t) = \frac{\vec{r}'(t)}{\|\vec{r}'(t)\|} = \frac{1}{\sqrt{1 + 4t^2 + 6t^4}} (1, 2t, 3t^2)$$

then add $t=1$ into the equation

$$T(1) = \frac{1}{\sqrt{1 + 4 + 6}} (1, 2, 3)$$

$$= \frac{1}{\sqrt{11}} (1, 2, 3)$$

$$= \left(\frac{1}{\sqrt{11}}, \frac{2}{\sqrt{11}}, \frac{3}{\sqrt{11}} \right)$$

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