INYANG MARTIN VECTOR M/SC101/053
COMPUTER SCIENCE

1 A = 5i - 7j - 6k
B = i + 4k
C = 9i - 4j + k

Find $-8(A+B)\cdot(C-A)$

$(A+B) = (5i - 6j - 2k)$

$-8(A+B) = -40i + 48j + 16k$

$(C-A) = 4i + 3j + 7k$

$$-8(A+B)\cdot(C-A) = \begin{matrix} i & j & k \\ -40 & 48 & 16 \\ 4 & 3 & 7 \end{matrix}$$

$$i\begin{vmatrix} 48 & 16 \\ 3 & 7 \end{vmatrix} - j\begin{vmatrix} -40 & 16 \\ 4 & 7 \end{vmatrix} + k\begin{vmatrix} -40 & 48 \\ 4 & 3 \end{vmatrix}$$

$= 288i + 344j - 312k$

2. $x = -3t, y = t^3, z = 4t^3$

differentiate $(-3t, t^3, 4t^3)$

$\therefore r'(t) = (-3, 3t^2, 12t^2)$

Divide the vector by its magnitude

$M = \sqrt{(-3)^2 + (3t)^2 + (12t)^2} = \sqrt{9 + 6t^2 + 24t^2}$

$\frac{r'(t)}{\|r'\|} = \frac{1}{\sqrt{9 + 4^3 + 24t^2}}(-3, 3t^2, 12t^2)$

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add $t=1$ to the equation

$$T(1) = \frac{1}{\sqrt{9+6+24}} \quad (-3, 3, 12)$$

$$\left(\frac{-3}{\sqrt{39}}, \frac{3}{\sqrt{39}}, \frac{12}{\sqrt{39}}\right)$$

3 $x = 8t^2$, $y = t^2 - 4t$, $z = t + 1$. Find acceleration.

$$\text{Velocity} = \frac{dy}{dt} = 16ti + (2t-4)j + 1k$$

$$\text{Acceleration} = 16i + 2j + 0k$$

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

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

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

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

$$= -10i - 9j - 10k$$

$$(A \times B) \times C = \begin{vmatrix} i & j & k \\ -10 & -9 & -10 \\ 0 & 4 & -3 \end{vmatrix}$$

$$i\begin{vmatrix} -9 & -10 \\ 4 & -3 \end{vmatrix} - j\begin{vmatrix} -10 & -10 \\ 0 & -3 \end{vmatrix} + k\begin{vmatrix} -10 & -9 \\ 0 & 4 \end{vmatrix}$$

$$= 67i - 30j - 40k$$

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

$$\int_0^1 R = \int 4\sin 3t\,i + \int 4e^{3t}j + \int 7t^3k$$

$$= \left[\frac{-4}{3}\cos 3(t)i + \frac{4}{3}e^{3(t)}j + \frac{7}{4}(t)^4k\right]_0^1$$

$$= \frac{-4}{3}\cos 3(1)i + \frac{4}{3}e^{3(1)}j + \frac{7}{4}(1)^4k \quad \text{when } t=1$$

$$= -1.33i + 10.87j + 1.75k$$

when $t=0$

$$\frac{-4}{3}\cos 3(0)i + \frac{4}{3}e^{3(0)}j + \frac{7}{4}(0)^4k$$

$$= -1.33i$$

$$\therefore [-1.33i + 10.87j + 1.75k] - [-1.33i]$$

$$= 10.87j + 1.75k$$