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DEPARTMENT: COMPUTER SCIENCE

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NUMBER 1and 2

① If $A = 5i - 7j - 6k$; $B = j + 4k$; $C = 4i - 4j + k$

To find $-8(A+B)\cdot(C-A)$

$$\Rightarrow -8(5i - 7j - 6k + j + 4k)\cdot(9i - 4j + k - (5i - 7j - 6k))$$

$$= -8(5i - 6j - 2k)\cdot(9i - 4j + k - 5i + 7j + 6k)$$

$$= (-40i + 48j + 16k)\cdot(4i + 3j + 7k)$$

$$= -160 + 144 + 122 = \underline{\underline{96}}$$

②

$$\bar{T} = \frac{dr/dt}{|dr/dt|}$$

where $r = xi + yj + zk$

$$\therefore r = (-3t)i + (t^2)j + (4t^3)k$$

$$\frac{dr}{dt} = \frac{d[(-3t)i + (t^2)j + (4t^3)k]}{dt}$$

$$\frac{dr}{dt} = -3i + 2tj + 12t^2k$$

at $t = 1$; $\frac{dr}{dt} = -3i + 2(1)j + 12(1)^2k$

$$= -3i + 2j + 12k$$

$$\left|\frac{dr}{dt}\right|_{t=1} = \sqrt{(-3)^2 + (2)^2 + (12)^2}$$

$$= \sqrt{9 + 4 + 144}$$

$$= \sqrt{157} = 12.53$$

Number 2 completion

$$\therefore \bar{T} = \frac{-3i + 2j + 12k}{12.53}$$

Number 3

(3) $x = -8t^2$, $y = t^2 - 4t$, $z = t + 1$

$r = xi + yj + zk = (-8t^2)i + (t^2 - 4t)j + (t + 1)k$

(v) Velocity $= \frac{dr}{dt} = (-16t)i + (2t - 4)j + k$

(a) Acceleration $= \frac{dv}{dt} = -16i + 2j + k$

Number 4 and 5

(4) $(\bar{A}\times\bar{B})\times\bar{C}$

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

$$= \cancel{i(2-8} \; i(2-12) - j(1-(-8)) + k(-3-4)$$

$$= i(-10) - j(1+8) + k(-7)$$

$$= -10i - 9j - 7k$$

$$(\bar{A}\times\bar{B})\times\bar{C} = \begin{vmatrix} i & j & k \\ -10 & -9 & -7 \\ 0 & 4 & -3 \end{vmatrix} = i\begin{vmatrix} -9 & -7 \\ 4 & -3 \end{vmatrix} - j\begin{vmatrix} -10 & -7 \\ 0 & -3 \end{vmatrix} + k\begin{vmatrix} -10 & -9 \\ 0 & 4 \end{vmatrix}$$

$$= i(27-(-28)) - j(30-0) + k(-40-0)$$

$$= i(55) - 30j - 40k$$

$$= 55i - 30j - 40k$$

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

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

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

$$\int_0^1 R = \frac{4i}{3}(-\cos(3t))\Big|_0^1 + \frac{4j e^{3t}}{3}\Big|_0^1 + \frac{7k\, t^4}{4}\Big|_0^1$$

$$\int_0^1 R = \frac{-4\cos(3t) i}{3}\Big|_0^1 + \frac{4e^{3t}}{3}j\Big|_0^1 + \frac{7t^4}{4}k\Big|_0^1$$

$$\int_0^1 R = \left[-\frac{4\cos(3(1))}{3} - \left(\frac{-4\cos(3(0))}{3}\right)\right]i + \left[\frac{4e^{3(1)}}{3} - \frac{4e^{3(0)}}{3}\right]j$$

$$+ \left[\frac{7(1)^4}{4} - \frac{7(0)^4}{4}\right]k$$

Number 5 completion

$$\int_0^1 R = \left[-1.33 - \left(\frac{-4}{3}\right)\right] i + \left[\frac{80.34}{3} - \frac{4}{3}\right] j + (1.75 - 0)\, k$$

$$\int_0^1 R = (-1.33 - (-1.33))\, i + (26.78 - 1.33)\, j + 1.75k$$

$$\int_0^1 R = 0i + 25.45j + 1.75k = 25.45j + 1.75k$$