

Aminone Oghenevweleto Alexander

19/EUG05/016
mech eng
Engineering

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

$$(A+B) = 5i - 7j + 6k + j + 4k$$
$$= 5i - 6j + 10k$$

$$(C-A) = 9i - 4j + k - 5i + 7j - 6k$$
$$= 4i + 3j - 5k$$

$$\therefore -8(A+B) \cdot (C-A) =$$
$$= -8(5i - 6j + 10k) \cdot (4i + 3j - 5k)$$
$$= -8 \times (20 - 18 - 14)$$
$$= -8 \times -12$$
$$= 96$$

② $x = -3t$, $y = t^2$, $z = 4t^3$

$$r = x + y + z$$

$$r = -3ti + t^2j + 4t^3k$$

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

$$\left. \frac{dr}{dt} \right|_{t=1} = -3i + 2j + 12k$$

$$\left| \left. \frac{dr}{dt} \right|_{t=1} \right| = \sqrt{(-3)^2 + (2)^2 + (12)^2}$$
$$= \sqrt{9 + 4 + 144}$$
$$= \sqrt{157}$$

$$e_r = \frac{\frac{dr}{dt}}{\left| \frac{dr}{dt} \right|}$$

$$= \frac{-5i + 2j + 12k}{\sqrt{157}}$$

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

$$r = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$$

$$r = -8t^2\mathbf{i} + (t^2 - 4t)\mathbf{j} + (t + 1)\mathbf{k}$$

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

$$\frac{d^2r}{dt^2} = -16\mathbf{i} + 2\mathbf{j} + \mathbf{k}$$

4) $A = \mathbf{i} + 2\mathbf{j} - 4\mathbf{k}$; $B = 2\mathbf{i} - 3\mathbf{j} + \mathbf{k}$

$$C = 4\mathbf{j} - 3\mathbf{k}$$

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

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

$$= -10\mathbf{i} - 9\mathbf{j} - 7\mathbf{k}$$

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

~~$$= i(30) - j(30) + k(40)$$~~

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

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

$$\textcircled{5} \quad R = 4 \sin 3t i + 4e^{3t} j + 7t^3 k = \int_0^1 R dt$$

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

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

$$= \left[-\frac{4}{3} \cos 3 i + \frac{4}{3} e^3 j + \frac{7}{4} k \right] - \left[-\frac{4}{3} i + \frac{4}{3} j + 0 \right]$$

$$= -1.32 i + 26.78 j + 1.74 k + 1.33 i - 1.33 j$$

$$= 0.01 i + 25.45 j + 1.74 k //$$