

1) $x = t^2, y = -5t^2 + t, z = t + 7$

$$\frac{dA}{dt} = 2ti + -10t + 1j + 1k$$

$$\frac{d^2A}{dt^2} = 2i - 10j + k$$

$$\frac{d^2A}{dt^2} = 2i - 10j + k$$

2) $(P \times Q) = \begin{vmatrix} i & j & k \\ 1 & -9 & -4 \\ 8 & -3 & 6 \end{vmatrix}$

$$= i \begin{vmatrix} -9 & -4 \\ -3 & 6 \end{vmatrix} - j \begin{vmatrix} 1 & -4 \\ 8 & 6 \end{vmatrix} + k \begin{vmatrix} 1 & -9 \\ 8 & -3 \end{vmatrix}$$

$$= i(-54 - 12) - j(6 + 32) + k(-3 + 72)$$

$$= -66i - 38j + 69k$$

$$(P \times Q) = -66i - 38j + 69k$$

$$(R \times P) = \begin{vmatrix} i & j & k \\ 1 & -4 & -3 \\ 1 & -9 & -4 \end{vmatrix}$$

$$= i \begin{vmatrix} -4 & -3 \\ -9 & -4 \end{vmatrix} - j \begin{vmatrix} 1 & -3 \\ 1 & -4 \end{vmatrix} + k \begin{vmatrix} 1 & -4 \\ 1 & -9 \end{vmatrix}$$

$$= i(16 - 27) - j(-4 + 3) + k(-9 + 4)$$

$$= -11i + 1j - 5k$$

$$(R \times P) = 11i + j - 5k$$

$$\therefore (P \times Q) \cdot (R \times P) = (-66i - 38j + 69k) \cdot (11i + j - 5k)$$

$$(P \times Q) \cdot (R \times P) = -726i - 38j - 345k$$

$$(P \times Q) \cdot (R \times P) = -1109$$

3) $\int F dt = 5(7 \sin 7t)i - 2(\frac{1}{3}e^{3t})j - 4(\frac{t^4}{4})k + C$

$$\int F dt = 35 \sin 7t i - \frac{2}{3} e^{3t} j - \frac{4t^4}{4} k + C$$