1 $M = pi - 6j - 3k$
$N = 4i + 3j - k$
$O = i - 3j + 2k$

t) $\bar{M} \cdot \bar{N} = 0$
$(pi - 6j - 3k) \cdot (4i + 3j - k) = 0$
$4p - 18j + 3k = 0$
$4p - 18 + 3 = 0$
$4p = 15$
$p = 15/4 = 3.75$

5) $\bar{M} \cdot |\bar{N} \times \bar{O}|$

$|\bar{N} \times \bar{O}| = \begin{vmatrix} 4 & 3 & -1 \\ 1 & -3 & 2 \end{vmatrix}$
$= i(6 - (3)) - j(8 - (-1)) + k(-12 - (3))$
$|\bar{N} \times \bar{O}| = 3i - 8j - 15k$

$\bar{M} \cdot |\bar{N} \times \bar{O}|$
$= pi - 6j - 3k \cdot (3i - 8j - 15k)$
$= 3p - 48 + 45$
$3p - 48 + 45 = 0$
$3p = 3$
$p = 1$

2 $(3i + 2j + 3k) + (2i - j + 6k) + (5i + 2j - 3k) =$
$= 10i + 3j + 8k$
$|a| = \sqrt{10^2 + 3^2 + 8^2} = \sqrt{173}$

$\cos\alpha = \frac{10}{\sqrt{173}} = 0.7003$

$\cos\beta = \frac{3}{\sqrt{173}} = 0.2280$

$\cos\gamma = \frac{3}{\sqrt{173}} = 0.6082$

Unit vector $= \frac{\vec{x}}{\text{magnitude of vector}}$

$= \frac{10}{\sqrt{173}} i + \frac{3}{\sqrt{173}} j + \frac{8}{\sqrt{173}} k$

$F = 3u\,i + u^2 j + (u+2)k$

$V = 2u\,i - 3u\,j + (u-2)k$

$(F \times V) = \begin{vmatrix} 3u & u^2 & u+2 \\ 2u & -3u & u-2 \end{vmatrix}$

$= i\,[u^2(u-2)] - [3u(u+2)] - j[3u \ldots]$

$- j\,[3u(u-2) - (u^2 \times 2u)] + k[-9u - 2u^3]$

Simplify

$= (u^3 - 2u^2 + 6u)i - (3u - 6u - 2u^3)j - (9u - 2u^3)k$

$= (u^3 - u^2 + 6u)i - (3u - 6u - 2u^3)j - (9u - 2u^3)k$

$$= \int (u^3 - u^2 + 3u) - \int (3u - 6u - 2u^3)\, j - \int (9u - 2u^3)\, k$$

$$= \frac{u^4}{4} - \frac{u^3}{3} + 3u^2 i - \left(-\frac{3u^2}{2} + u^4\right) j - \left(\frac{9u^2}{2} - u^4\right) k$$

$$= \frac{u^4}{4} - \frac{u^3}{3} + 3u^2 i + \frac{3u^2}{2} - u^4 j - \frac{9u^2 - u^4}{2} k \Big|_0^1$$

For i

$$= \underline{u^4} \left[\frac{1^4}{4} - \frac{1^3}{3} + 3\times 1^2 - \left(\frac{0^4}{4} - \frac{0^3}{3} + 3\times 0^2\right)\right] i$$

$$= \frac{35}{12} i$$

For j

$$\left[\frac{3\times 1^2 + 1^4}{2} - \left(\frac{3\times 0^2 + 0^4}{2}\right)\right] j$$

$$= 2 j$$

For K

$$\left[\frac{9\times 1^2 - 1^4}{2} - \frac{9\times 0^2 - 0^4}{2}\right] K$$

$$= 4 K$$

$$\therefore \int F \times v \, du = \frac{35}{12} i + 2 j - 4 K$$