2) $\vec{V} = (3i + j + 5k) + (2i + j + 6k) + (5i + 2j - 3k)$

$10i + 3j + 8j$

$a_x = 10 \quad a_y = 3 \quad a_z = 8$

$|V| = \sqrt{10^2 + 3^2 + 8^2}$

$= \sqrt{173} = 13.15$

The direction cosines are

$\cos\alpha = \dfrac{a_x}{|V|} = \dfrac{10}{13.15} = 0.761$

$\cos\beta = \dfrac{a_y}{|V|} = \dfrac{8}{13.15} = 0.228$

$\cos\gamma = \dfrac{a_z}{|V|} = \dfrac{8}{13.18} = 0.608$

ii) unit vector:

$e_v = \dfrac{V}{|V|} = \dfrac{10i + 3j + 8k}{13.18}$

3) $F = 3ui + u^2j + (u+2)k$ and $V = 2ui - 3uj + (u-2)k$

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

$$i \begin{vmatrix} u^2 & (u+2) \\ -3u & (u-2) \end{vmatrix} - j \begin{vmatrix} 3u & (u+2) \\ 2u & (u-2) \end{vmatrix} + k \begin{vmatrix} 3u & u^2 \\ 2u & -3u \end{vmatrix}$$

$i\,[u^2(u-2) + 3u(u+2)] - j\,[3u(u-2) - 2u(u+2)]\,k\,[3u \cdot -3u - 2u \cdot u^2]$

$[u^3 - 2u^2 + 3u^2 + 6u] - j\,[3u^2 - 6u - 2u^2 - 4u^2 + k\,[-9u^2 - 2u^3]$

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$$1\left[u^3 - 2u^2 + 3u^2 + 6u\right] - 1\left[u^2 - 10u\right] + k\left[-2u^3 - 9u^2\right]$$

$$= 1\left[u^3 + u^2 + 6u\right] - 1\left[u^2 - 10u\right] + 1k\left[-2u^3 - 9u^2\right]$$

$$\int_0^1 \left[F \times v\right] = \int 1\left(u^3 + u^2 + 6u\right] - \int 1\left[u^2 - 10u\right] + \int k\left[-2u^3 - 9u^2\right.$$

$$= 1\int u^3 + u^2 + 6u - 1\int u^2 - 10u + 1k\int -2u^3 - 9u^2$$

$$= \left[\frac{u^4}{4} + \frac{u^3}{3} + 3u^2\right] - 1\left[\frac{u^3}{3} - 5u^2 + k\left[-\frac{u^4}{2} - 3u^3\right] +\right.$$

$$\int_0^1 (F \times v) = 1\left[\frac{1}{4} + \frac{1}{3} + 3\right] - 1\left[\frac{1}{3} - 5\right] + k\left[\frac{-1}{3} - 3\right] + c\left[0 + 0\right]$$

$$= 1\left[\frac{43}{12}\right] - 1\left[\frac{-14}{3}\right] + k\left[\frac{-7}{2}\right]$$

$$\int_0^1 \left[F \times v\right] = \frac{43}{12}\, i + \frac{14}{3}\, j - \frac{7}{2}\, k$$