② $(3i+2j+5k, 2i-j+6k$ and $5i+2j-3k)$

$= 10i + 3j + 8k$

$|r| = \sqrt{10^2+3^2+8^2} = \sqrt{173} = 13.15$

$\cos\alpha = \frac{10}{13.15}$

$\alpha = \cos^{-1}\left[\frac{10}{13.15}\right] = 40.5$

$\cos\beta = \frac{3}{13.15}$

$\beta = \cos^{-1}\left[\frac{3}{13.15}\right] = 76.8$

$\cos\gamma = \frac{8}{13.15}$

$\gamma = \cos^{-1}\left[\frac{8}{13.15}\right] = 52.5$

(B) $e_r = \frac{10i + 3j + 8k}{13.15}$

$e_x = \frac{10i}{13.15} + \frac{2j}{13.15} + \frac{8k}{13.15}$

③ $r = 3ui + u^2j + (u+2)k$

$v = 3ui - 3uj + (u-2)k$

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

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

$= i(u^3 + u^2 + 6u) - i(u^2 - 10u) + k(2u^3 - 9u^2)$

$\int_0^1 f\,du = \int_0^1 (u^3+u^2+6u)i - (u^2-10u) + (-2u^3-9u^2)k)\,du$

$= \int_0^1 \left(\frac{u^4}{4} + \frac{u^3}{3} + 3u^2\right)i - \left(\frac{u^3}{3} - 5u^2\right) + \left(\frac{-u^4}{2} - 3u^3\right)$

$= \left[\frac{1}{4} + \frac{1}{3} + 3u^0\right]i - \left[\frac{i^3}{3} - 5(1)^2\right]j + \left[\left(\frac{-1^4}{2} - 3(1)^3\right)k\right] + C$

$= \frac{43}{12}i + \frac{14}{3}j + \frac{5}{2}k + C$ → [OTC]

$= \frac{43}{12}i + \frac{14}{3}j + \frac{5}{2}k$

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(1) $\vec{M} = P\vec{i} - 6\vec{j} - 3\vec{k}$, $\vec{N} = 4\vec{j} + 3\vec{i} - \vec{k}$, $\vec{O} = \vec{i} - 3\vec{j} + 2\vec{k}$. find the value of P for which

(a) $\vec{M} \cdot \vec{N}$ is perpendicular

$= (P\vec{i} - 6\vec{j} - 3\vec{k}) \cdot 4\vec{i} + 3\vec{j} - \vec{k}$

$= 4P - 18 + 3q$

$= 4p - 15$

$\vec{M} \cdot \vec{N} = 0$ (perpendicular)

$4p - 15 = 0$

$4p = 15$

$p = 15/4$

(b) $\vec{M} \cdot (\vec{N} \times \vec{O}) = 0$

$$\vec{N} \times \vec{O} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 4 & 3 & -1 \\ 1 & -3 & 0 \end{vmatrix}$$

$= \vec{i}(6 - (3)) - \vec{j}(8 - (-1)) + \vec{k}(-12 - 3)$

$= 3\vec{i} - 9\vec{j} - 15\vec{k}$

$\vec{M} \cdot (\vec{N} \times \vec{O}) = (P\vec{i} - 6\vec{j} - 3\vec{k}) \cdot (3\vec{i} - 9\vec{j} - 15\vec{k})$

$= 3P + 99$

$\vec{M} \cdot (\vec{N} \times \vec{O}) = 0$

$0 = 3P + 99$

$P = 99/3$

$= 33$