19/SCIO1/053

$$\cos\alpha = \frac{a_x}{|r|} = \frac{11}{13.92}$$

$$\cos\beta = \frac{a_y}{|r|} = \frac{3}{13.92}$$

$$\cos\gamma = \frac{a_z}{|r|} = \frac{-8}{13.92}$$

$$A = 11i + 3j - 8k$$

$$e = \frac{\bar{A}}{|A|} = \frac{11i + 3j - 8k}{\sqrt{11^2 + 3^2 + (-8)^2}} = \frac{11i}{13.92} + \frac{3j}{13.92} - \frac{8k}{13.92}$$

3. $F = 3ui + u^2 j + (u+2)k$, $v = 2ui + -3uj + (u-2)k$

$$\int_1^0 (f \times v)\, du$$

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

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

$[(u^3 - 2u^2) - (-3u^2 - 6u)]i - [(3u^2 - 6u) - 2(2u^2 + 4u)]j + [(-9u^2 - 2u^3]k$

$= [u^3 - 2u^2 + 3u^2 + 6u]i - [3u^2 - 6u - 2u^2 - 4u]j + [-9u^2 - 2u^3]k$

$= [u^3 + u^2 + 6u] - [u^2 - 10u]j + [-9u^2 - 2u^3]k$

$= [u^3 + u^2 + 6u) + (-u^2 + 10u)j + (-9u^2 - 2u^3)k\,]_1^0$

$= -[(1+1+6)i + (-1+10)j + (-9-2)k]$

$= -8i - 9j + 11k$

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COMPUTER SCIENCE

1. $M = Pi - 6j - 3k$

$N = 4i + 3j - k$

$O = 1i - 3j + 2k$

(a) M and N are perpendicular to each other

$(M \cdot N) = (pi - 6j - 3k) \cdot (4i + 3j - k)$

$4p - 18 + 3$

$4p - 15$

Since they are perpendicular

$4p - 15 = 0$

$4p = \frac{15}{4}$ $p = \frac{15}{4}$ or $\underline{3.75}$

b $M \cdot (N \times O) = \begin{vmatrix} p & -6 & -3 \\ 4 & 3 & -1 \\ 1 & -3 & 2 \end{vmatrix}$

$p\begin{vmatrix} 3 & -1 \\ -3 & 2 \end{vmatrix} - 6\begin{vmatrix} 4 & -1 \\ 1 & 2 \end{vmatrix} - 3\begin{vmatrix} 4 & 3 \\ 1 & -3 \end{vmatrix}$

$P(3) + 54 + 45 = 0$

$3p = \frac{-99}{3}$, $p = \underline{-33}$

2. Sum of $(3i + 2j + 5k) + (2i - j + 6k) + (5i + 2j - 3k)$

$11i + 3j - 8k$

Direction of cosine

$ax = 11$ $ay = 3$ $az = -8$

$|R| = \sqrt{(11)^2 + (3)^2 + (-8)^2}$

$\sqrt{121 + 9 + 64}$

$\sqrt{194}$

$= \underline{13.92}$