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MATRIC NO:- 18/mhs01/171

DEPARTMENT:- Anatomy

COURSE:- MAT 102

ASSIGNMENT

1) If $A = 3i + 7j - 2k$, $B = i + 3j + 7k$, $C = 9i - 4j + 6k$ - Find the angle between

a. A and C

b. B and C

c. the unit vector in the direction of $(A + B + C)$

2) A particle moves along a curve, $x = 8t^2$, $y = t^2 - 4t$, $z = t + 1$, where t is time. Find the modulus of accelration at $t = 1$

3) If $A = 4i + 2j - 4k$, $B = 8i - 9j + k$, $C = i + 4j - 3k$ - Find the vector triple product $(A \times B) \times C$

ANSWER

2) $x = 8t^2$ $y = t^2 - 4t$ $z = t + 1$

$r = xi + yj + zk$

$= (8t^2)i + (t^2 - 4t)j + (t+1)k$

Acceleration $= d^2r/dt^2 = 16i + 2j$ // (ANS).

3) $A = 4i + 2j - 4k$, $B = 8i - 9j + k$, $C = i + 4j - 3k$ - $(A \times B) \times C$

$(A \times B)$

$$\begin{vmatrix} i & j & k \\ 4 & 2 & -4 \\ 8 & -9 & 1 \end{vmatrix} = i\begin{vmatrix} 2 & -4 \\ -9 & 1 \end{vmatrix} - j\begin{vmatrix} 4 & -4 \\ 8 & 1 \end{vmatrix} + k\begin{vmatrix} 4 & 2 \\ 8 & -9 \end{vmatrix}$$

$(2 - 4q)i \quad -(4 - (-32) = 28j \quad (-4q - 16)k$

$= (2-4q)i + 28j + (-4q-16)k$

$\therefore (A \times B) \times C$

$$\begin{vmatrix} i & j & k \\ 2-4q & 28 & -4q-16 \\ 1 & 4 & -3 \end{vmatrix}$$

$$i\begin{vmatrix} 28 & -4q-16 \\ 4 & -3 \end{vmatrix} - j\begin{vmatrix} 2-4q & -4q-16 \\ 1 & 3 \end{vmatrix} + k\begin{vmatrix} 2-4q & 28 \\ 1 & 4 \end{vmatrix}$$

$= -84 - (4(-4q-16)$ $= -(3(2-4q) - (1(-4q-16)$ $4(2-4q) - 28$

$= -84 - (-16q - 64)$ $= -(6 - (2q + 4q + 16)$ $8 - 16q - 28$

$= -84 + 16q + 64$ $= -(22 - 8q)$ $-16q - 20$

$16q - 20$ $= +8q - 22$

$\therefore = 16q - 20 + 8q - 22 - 16q - 20$

$= 8q - 62$ // (ANS)

$a \cdot \theta = \cos^{-1} \dfrac{A \cdot C}{|A|\,|C|}$

$A \cdot C = (3i + 7j - 2k) \cdot (9i - 4j + 6k)$

$= 27 - 28 - 12$

$= -13$

$|A| = \sqrt{3^2 + 7^2 + (-2)^2}$

$= \sqrt{62}$

$|C| = \sqrt{9^2 + (-4)^2 + 6^2}$

$= \sqrt{133}$

$\theta = \cos^{-1} \dfrac{-13}{\sqrt{62} \times \sqrt{133}}$

$\theta = \cos^{-1}(0.14316)$

$\theta = 98.23°$ //

$\theta = \cos^{-1} \frac{B \cdot C}{|B|\,|C|}$

$B \cdot C = (i + 3j + 7k) \cdot (9i - 4j + 6k)$

$= 9 - 12 + 42$

$= 39$

$|B| = \sqrt{1^2 + 3^2 + 7^2}$

$= \sqrt{59}$

$|C| = \sqrt{9^2 + (-4)^2 + 6^2}$

$= \sqrt{133}$

$\theta = \cos^{-1} \frac{39}{\sqrt{59} \cdot \sqrt{133}}$

$\theta = \cos^{-1}(0.44026)$

$\theta = 63.88°$

$C \cdot A + B + C$

$(5i + 7j - 2k) + (i + 3j + 7k) + (9i - 4j + 6k)$

$= (5i + i + 9i + 7j + 3j - 4j - 2k + 7k + 6k)$

$= 13i + 6j + 11k$

$\hat{u} = \frac{u}{|u|}$

$= \sqrt{13^2 + 6^2 + 11^2}$

$= \sqrt{326}$

$= 18.05$

$\hat{u} = \frac{13i + 6j + 11k}{18.05}$

$= \frac{13i}{18.05} + \frac{6j}{18.05} + \frac{11k}{18.05}$