NAME: BALOGUN SHAMSUDEEN MUHAMMAD
DEPARTMENT: COMPUTER SCIENCE
MATRIC NUMBER: 19/SCI01/028

NAME: BALOGUN SHAMSUDEEN MUHAMMAD
DEPARTMENT: COMPUTER SCIENCE
MATRIC NUMBER: 19/SCI.01/028

ASSIGNMENT

1. $A = 3i + 7j - 2k$
$B = i + 3j + 7k$
$C = 9i - 4j + 6k$

(a) Angle between A and C

$A \cdot C = (3i + 7j - 2k) \cdot (9i - 4j + 6k)$
$= 27 - 28 - 12$
$= -13$

$|A| = \sqrt{(3)^2 + (7)^2 + (-2)^2}$
$= \sqrt{9 + 49 + 4}$
$= \sqrt{62}$

$|C| = \sqrt{(9)^2 + (-4)^2 + (6)^2}$
$= \sqrt{81 + 16 + 36}$
$= \sqrt{133}$

$\cos \theta = \frac{-13}{\sqrt{62} \times \sqrt{133}} = \frac{-13}{90.808}$

$\theta = \cos^{-1}\left(\frac{-13}{90.808}\right)$

$\theta = 98.23°$

(ii) Angle between B and C

$B \cdot C = (i + 3j + 7k) \cdot (9i - 4j + 6k)$
$= 9 - 12 + 42$
$= 39$

$|B| = \sqrt{(1)^2 + (3)^2 + (7)^2}$
$= \sqrt{1 + 9 + 49}$
$= \sqrt{59}$

$|C| = \sqrt{9^2 + (-4)^2 + (6)^2}$
$= \sqrt{81 + 16 + 36}$
$= \sqrt{133}$

$\cos \theta = \frac{39}{\sqrt{59} \times \sqrt{133}}$

$\cos \theta = \frac{39}{88.583}$

$\theta = \cos^{-1}\left(\frac{39}{88.583}\right)$

$\theta = 63.88°$

(iii) $e_{A+B+C} = \frac{A+B+C}{|A+B+C|}$

$A + B + C = (3i + 7j - 2k) + (i + 3j + 7k) + (9i - 4j + 6k)$
$= 13i + 6j + 11k$

$|A + B + C| = \sqrt{(13)^2 + (6)^2 + (11)^2}$
$= \sqrt{169 + 36 + 121}$
$= \sqrt{326}$

$e_{A+B+C} = \frac{13i + 6j + 11k}{\sqrt{326}}$

2. $x = -8t^2$, $y = t^2 - 4t$ and $Z = t+1$, find modulus of acceleration

Soln
$r = x_i + y_j + zk$
$r = -8t^2 i + (t^2 - 4t)j + (t+1)k$
Velocity $= \frac{dr}{dt} = 16t i + (2t - 4)j + k$

Acceleration $= \frac{d^2 r}{dt^2} = -16i + 2j$

$\left|\frac{d^2 r}{dt^2}\right| = \frac{\sqrt{(-16)^2 + (2)^2}}{\sqrt{256 + 4}}$
$= \sqrt{260}$ or 16.13

3. $A = 4i + 2j - 4k$

$B = 8i - 2j + k$

$C = i + 4j - 3k$

$(A \times B) \times C$

$(A \times B) = \begin{vmatrix} i & j & k \\ 4 & 2 & -4 \\ 8 & -2 & 1 \end{vmatrix}$

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

$= i(2 - (8)) - j(4 - (-32)) + k(-8 - 16)$

$= -6i - 36j - 24k$

$(A \times B) \times C = \begin{vmatrix} i & j & k \\ -6 & -36 & -24 \\ 1 & 4 & -3 \end{vmatrix}$

$= i \begin{vmatrix} -36 & -24 \\ 4 & -3 \end{vmatrix} - j \begin{vmatrix} -6 & -24 \\ 1 & -3 \end{vmatrix} + k \begin{vmatrix} -6 & -36 \\ 1 & 4 \end{vmatrix}$

$= i(108 - (-96)) - j(18 - (-24)) + k(-24 - (-36))$

$= i(108 + 96) - j(18 + 24) + k(-24 + 36)$

$= 204i - 42j + 12k.$