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 MATRIC NUMBER: 19/SCI01/057
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Assignment

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

ii) Angle between A and C
 $\vec{A} \cdot \vec{C} = (3i + 7j - 2k) \cdot (9i - 4j + 6k)$
 $= 27 - 28 - 12$
 $= -13$
 $|\vec{A}| = \sqrt{3^2 + 7^2 + (-2)^2}$
 $= \sqrt{9 + 49 + 4}$
 $= \sqrt{62}$
 $|\vec{C}| = \sqrt{9^2 + (-4)^2 + 6^2}$
 $= \sqrt{81 + 16 + 36}$
 $= \sqrt{133}$
 $\cos \theta = \frac{-13}{\sqrt{62} \times \sqrt{133}}$
 $\theta = \cos^{-1} \left(\frac{-13}{90.808} \right)$
 $\theta = 99.23^\circ$

iii) Angle between B and C
 $\vec{B} \cdot \vec{C} = (i + 3j + 2k) \cdot (9i - 4j + 6k)$
 $= 9 - 12 + 12$
 $= 9$
 $|\vec{B}| = \sqrt{1^2 + 3^2 + 2^2}$
 $= \sqrt{1 + 9 + 4}$
 $= \sqrt{14}$
 $|\vec{C}| = \sqrt{9^2 + (-4)^2 + 6^2}$
 $= \sqrt{81 + 16 + 36}$
 $= \sqrt{133}$
 $\cos \theta = \frac{9}{\sqrt{14} \times \sqrt{133}}$
 $\theta = \cos^{-1} \left(\frac{9}{98.583} \right)$
 $\theta = 68.86^\circ$

Scanned with CamScanner

$\theta = \cos^{-1} \left(\frac{29}{98.583} \right)$
 $\theta = 68.86^\circ$

iii) $\vec{A} + \vec{B} + \vec{C} = \vec{A} + \vec{B} + \vec{C}$
 $= (3i + 7j - 2k) + (i + 3j + 2k) + (9i - 4j + 6k)$
 $= 13i + 6j + 11k$
 $|\vec{A} + \vec{B} + \vec{C}| = \sqrt{13^2 + 6^2 + 11^2}$
 $= \sqrt{169 + 36 + 121}$
 $= \sqrt{326}$
 $\vec{A} + \vec{B} + \vec{C} = 13i + 6j + 11k$
 $|\vec{A} + \vec{B} + \vec{C}| = \sqrt{326}$

2) $x = -3t^2, y = t^2 - 4t$ and $z = t + 1$, find modulus of acceleration
 solution
 $\vec{r} = 30i + 4j + 2k$
 $\vec{v} = -6t\vec{i} + (2t - 4)\vec{j} + \vec{k} + 12\vec{k}$
 velocity $= \vec{v} = -6t\vec{i} + (2t - 4)\vec{j} + \vec{k}$
 at
 Acceleration $= \frac{d^2\vec{r}}{dt^2} = -6\vec{j} + 2\vec{j}$
 $|\vec{a}| = \sqrt{(-6)^2 + 2^2}$
 $= \sqrt{36 + 4}$
 $= \sqrt{40}$ or 16.12

3) $A = 4i + 2j - 4k$
 $B = 8i - 2j + k$
 $C = i + 4j - 3k$
 $(A \times B) \times C$
 $(A \times B) = \begin{vmatrix} i & j & k \\ 4 & 2 & -4 \\ 8 & -2 & 1 \end{vmatrix}$

$$\begin{array}{c}
 i \begin{array}{|c|c|c|c|c|c|} \hline 2 & -4 & -j & 4 & -4 & +k \\ \hline -2 & 1 & & 8 & 1 & \\ \hline \end{array} \begin{array}{|c|c|} \hline 4 & 2 \\ \hline 8 & -2 \\ \hline \end{array} \\
 i(2-(-8)) - j(4-(-32)) + k(-8-16) \\
 = 6i - 36j - 24k \\
 (A \times B) \times C = \begin{array}{|c|c|c|} \hline i & j & k \\ \hline 6 & -36 & -24 \\ \hline 1 & 4 & 3 \\ \hline \end{array} \\
 = i \begin{array}{|c|c|c|c|c|c|} \hline -36 & -24 & -j & -6 & -24 & +k \\ \hline 4 & -3 & 1 & -3 & 1 & 4 \\ \hline \end{array} \begin{array}{|c|c|} \hline -6 & -36 \\ \hline 1 & 4 \\ \hline \end{array} \\
 = i(108 - (-96)) - j(18 - (-24)) + k(624 - 636) \\
 = i(108 + 96) - j(18 + 24) + k(-24 + 36) \\
 = 204i - 42j + 12k
 \end{array}$$