

OMOLUABI SEAN SEREMI

MAT 102

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

i) A and C

$$A \cdot C = |A||C| \cos \theta$$

$$\cos \theta = \frac{A \cdot C}{|A||C|}$$

$$|A||C|$$

$$A \cdot C = (3 \times 9) + (7 \times -4) + (-2 \times 6) = -13$$

$$|A| \times |C| = \sqrt{3^2 + 7^2 + (-2)^2} \times \sqrt{9^2 + (-4)^2 + 6^2} = \sqrt{62} \times \sqrt{133}$$

$$\theta = \cos^{-1} \frac{-13}{\sqrt{62} \times \sqrt{133}} = 98.23^\circ$$

$$\sqrt{62} \times \sqrt{133}$$

ii) B and C

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

$$B \cdot C = (1 \times 9) + (3 \times -4) + (7 \times 6) = 39$$

$$|B| \times |C| = \sqrt{1^2 + 3^2 + 7^2} \times \sqrt{9^2 + (-4)^2 + 6^2} = \sqrt{59} \times \sqrt{133}$$

$$\theta = \cos^{-1} \frac{39}{\sqrt{59} \times \sqrt{133}} = 63.88^\circ$$

$$\sqrt{59} \times \sqrt{133}$$

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

$$(A + B + C) = 13i + 6j + 11k$$

$$|A + B + C| = \sqrt{13^2 + 6^2 + 11^2} = \sqrt{326}$$

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

$$|A + B + C| = \sqrt{326}$$

$$2) \quad x = -8t^2, \quad y = t^2, \quad z = t + 1$$

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

$$d^2P/dt^2 = \text{acceleration}$$

$$dP/dt = -16t i + (2t - 4) j + k$$

$$d^2P/dt^2 = -16i + 2j$$

$$|A| = \sqrt{(-16)^2 + 2^2} = \sqrt{260} = 16.12$$

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

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

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

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

$$= -6i - 36j - 32k$$

$$(A \times B) \times C = \begin{vmatrix} i & j & k \\ -6 & -36 & -32 \\ 1 & 4 & -3 \end{vmatrix} = \begin{vmatrix} -36 & -32 \\ 4 & -3 \end{vmatrix} i - \begin{vmatrix} -6 & -32 \\ 1 & -3 \end{vmatrix} j + \begin{vmatrix} -6 & -36 \\ 1 & 4 \end{vmatrix} k$$

$$= (108 + 128)i - (18 + 32)j + (-24 + 36)k$$

$$= 236i - 50j + 12k$$