

MECHATRONICS ENGINEERING

19 / EWG05 / 020

Mr Okunlo / Dr Ogelami's group

MAT 102

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

$$B = i + 3j + 7k$$

$$\cos \theta = \frac{u \cdot v}{|u||v|}$$

$$\angle \text{btwn } A \text{ and } C = \frac{(3i+7j-2k) \cdot (9i-4j+6k)}{(\sqrt{3^2+7^2+(-2)^2}) \cdot (\sqrt{9^2+(-4)^2+6^2})}$$

$$\angle \text{btwn } A \text{ and } C = \frac{27 - 28 - 12}{(\sqrt{62}) \cdot (\sqrt{133})} = \frac{-13}{90.80}$$

$$\cos \theta = -0.1432$$

$$\theta = \cos^{-1} -0.1432 = 98.23$$

$$\angle \text{btwn } B \text{ and } C = \frac{(i+3j+7k) \cdot (9i-4j+6k)}{(\sqrt{1^2+3^2+7^2}) \cdot (\sqrt{9^2+(-4)^2+6^2})}$$

$$\cos \theta = \frac{9 - 12 + 42}{(\sqrt{59}) \cdot (\sqrt{133})} = \frac{39}{88.583}$$

$$\theta = \cos^{-1} 0.44026 = 63.88$$

Unit vector of $(A+B+C) = \frac{(A+B+C)}{|A+B+C|}$

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

$$A+B+C = 13i + 14j + 9k$$

$$|A+B+C| = \sqrt{13^2 + 14^2 + 9^2} = \sqrt{326} = 18.06$$

$$e_{A+B+C} = \frac{13i + 14j + 9k}{18.06}$$

$$= \frac{13}{18.06}i + \frac{14}{18.06}j + \frac{9}{18.06}k$$

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$$x = 8t^2 \quad y = t^2 - 4t$$

$$\frac{dx}{dt} = 16t \quad \frac{dy}{dt} = 2t - 4$$

$$v = \sqrt{(16t)^2 + (2t-4)^2} = \sqrt{256t^2 + 4t^2 - 16t + 16} = \sqrt{260t^2 - 16t + 16}$$

$$v = 16i + 2j$$

$$(A \times B) \times C = \begin{array}{c} i \\ 6 \\ 1 \end{array} \begin{array}{c} j \\ -36 \\ 4 \end{array} \begin{array}{c} k \\ -24 \\ -3 \end{array} = i(108 - -96) - j(18 - -24) + k(-24 - -36)$$

$$(A \times B) \times C = 204i - 42j + 12k$$