



Assignment - 12.10.2.11

Surajit Sarkar

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I. PROBLEM

Show that the vectors $2\hat{i} + 3\hat{j} + 4\hat{k}$ and $-4\hat{i} + 6\hat{j} - 8\hat{k}$ are collinear .

II. SOLUTION

given

$$\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k} \quad (1)$$

$$\vec{b} = 4\hat{i} + 6\hat{j} - 8\hat{k} \quad (2)$$

$$\begin{pmatrix} \mathbf{A}^\top \\ \mathbf{B}^\top \end{pmatrix} = 1 \quad (3)$$

$$\begin{pmatrix} \mathbf{A}^\top \\ \mathbf{B}^\top \end{pmatrix} = \begin{pmatrix} 2 & -3 & 4 \\ -4 & 6 & -8 \end{pmatrix} \quad (4)$$

Forming the collinearity matrix (5)

$$\begin{pmatrix} 2 & -3 & 4 \\ -4 & 6 & -8 \end{pmatrix} \xrightarrow{\frac{1}{2}R_1 \rightarrow R_1} \begin{pmatrix} 1 & -\frac{3}{2} & 2 \\ -4 & 6 & -8 \end{pmatrix} \quad (6)$$

$$\xrightarrow{-\frac{1}{4}R_2 \rightarrow R_2} \begin{pmatrix} 1 & -\frac{3}{2} & 2 \\ 1 & \frac{3}{2} & 2 \end{pmatrix} \quad (7)$$

$$\xrightarrow{R_2 - R_1 \rightarrow R_2} \begin{pmatrix} 1 & -\frac{3}{2} & 2 \\ 0 & 0 & 0 \end{pmatrix} \quad (8)$$

They have opposite direction

Since \vec{a} and \vec{b} are same line they are collinear

<https://github.com/sssurajit/fwc/blob/main/vectors/12.10.2.11/codes/vector.py>

Execute the code by using the command

python3 vector.py

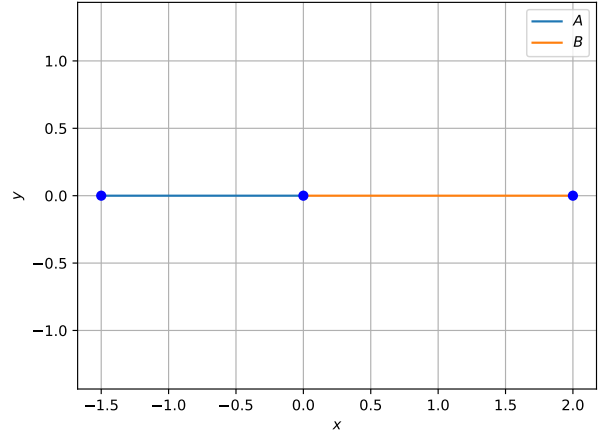


Fig. 1

III. FIGURE