# Assignment - 12.10.2.11

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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

$$\mathbf{A}=\begin{pmatrix}2\\3\\4\end{pmatrix}\ \mathbf{B}=\begin{pmatrix}-4\\6\\-8\end{pmatrix} \tag{1}$$

$$\begin{pmatrix}\mathbf{A}^\top\\\mathbf{B}^\top\end{pmatrix}=1 \tag{2}$$

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

Forming the collinearity matrix (4)

$$\begin{pmatrix}2&-3&4\\-4&6&-8\end{pmatrix}\xleftrightarrow{\frac{1}{2}R_1\to R_1}\begin{pmatrix}1&-\frac{3}{2}&2\\-4&6&-8\end{pmatrix} \tag{5}$$

$$\xleftrightarrow{-\frac{1}{4}R_2\to R_2}\begin{pmatrix}1&-\frac{3}{2}&2\\1&\frac{3}{2}&2\end{pmatrix} \tag{6}$$

$$\xleftrightarrow{R_2-1R_1\to R_2}\begin{pmatrix}1&-\frac{3}{2}&2\\0&0&0\end{pmatrix} \tag{7}$$

There is 1 nonzero in the row echelon form of the matrix,so the rank is 1 . if rank of the matrix is 1 then the vectors are collinear

## III. Code Link

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**

## IV. Figure

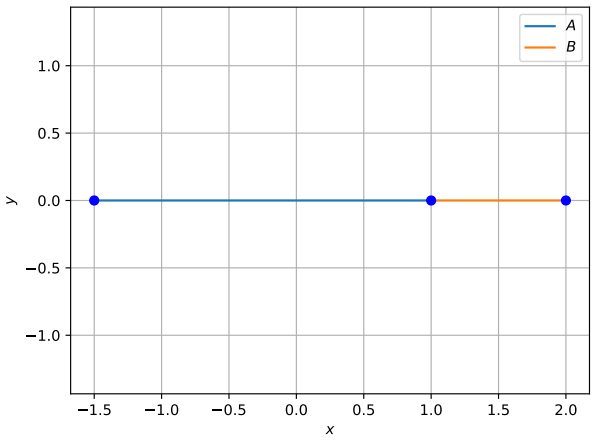


Fig. 1