

# Assignment 1

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Download all python codes

<https://github.com/Vallidevibolla/704-Valli-Devi-assignment/blob/main/Collinear.py>

and latex-tikz codes from

<https://github.com/Vallidevibolla/704-Valli-Devi-assignment/blob/main/latex>

Question taken from

cbse/math/10/2008/qp-math-x-2008.pdf Code  
30/2/1- Q.no.14

Now we row reduce the matrix  $\mathbf{M}$ ,

$$\begin{pmatrix} k-6 & 5 \\ 9 & -6 \end{pmatrix} \xrightarrow{R_1 \leftrightarrow R_2} \begin{pmatrix} 9 & -6 \\ k-6 & 5 \end{pmatrix} \quad (2.0.4)$$

$$\leftrightarrow \begin{pmatrix} 9 & -6 \\ 0 & 9 \times 5 - (-6 \times (k-6)) \end{pmatrix} \quad (2.0.5)$$

$$\leftrightarrow \begin{pmatrix} 9 & -6 \\ 0 & 9 + 6k \end{pmatrix} \quad (2.0.6)$$

$$\xrightarrow{R_2 \rightarrow \frac{R_2}{6}} \begin{pmatrix} 9 & -6 \\ 0 & \frac{3}{2} + k \end{pmatrix} \quad (2.0.7)$$

$$\xrightarrow{R_1 \rightarrow \frac{R_1}{3}} \begin{pmatrix} 1 & -\frac{2}{3} \\ 0 & \frac{3}{2} + k \end{pmatrix} \quad (2.0.8)$$

Since  $\text{rank}(\mathbf{M}) = 1$ , we have

$$\frac{3}{2} + k = 0 \quad (2.0.9)$$

$$\Rightarrow k = -\frac{3}{2} \quad (2.0.10)$$

## 1 QUESTION 14

Find the value of  $k$ , if the points

$\mathbf{A} = \begin{pmatrix} k \\ 3 \end{pmatrix}$ ,  $\mathbf{B} = \begin{pmatrix} 6 \\ -2 \end{pmatrix}$ ,  $\mathbf{C} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$  are collinear

## 2 SOLUTION

Given:- Given:-  $\mathbf{A} = \begin{pmatrix} k \\ 3 \end{pmatrix}$ ,  $\mathbf{B} = \begin{pmatrix} 6 \\ -2 \end{pmatrix}$ ,  $\mathbf{C} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$

Given that the points are collinear, so we create a matrix

$$\mathbf{M} = (\mathbf{A} - \mathbf{B} \quad \mathbf{B} - \mathbf{C})^T \quad (2.0.1)$$

where  $\text{rank}(\mathbf{M}) = 1$ . We have the matrix  $\mathbf{M}$  as,

$$\mathbf{M} = \begin{pmatrix} k-6 & 3-(-2) \\ 6-(-3) & -2-4 \end{pmatrix} \quad (2.0.2)$$

$$\Rightarrow \mathbf{M} = \begin{pmatrix} k-6 & 5 \\ 9 & -6 \end{pmatrix} \quad (2.0.3)$$

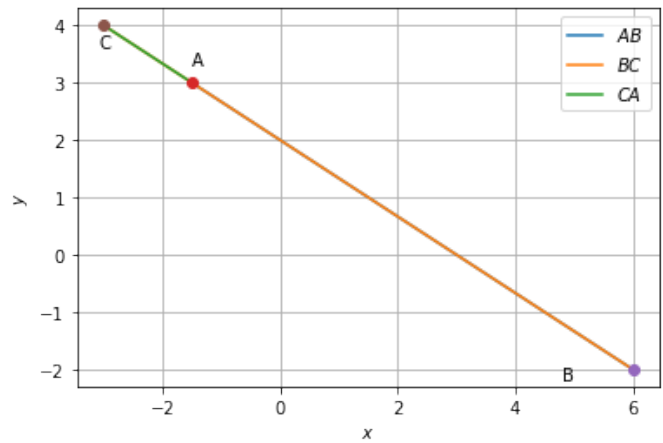


Fig. 2.1: Graphical solution

$\therefore$  The figure verifies that the points are indeed collinear for  $k = -\frac{3}{2}$