

MATRICES USING PYTHON

R.Ramesh

rameshrandhigra@gmail.com

FWC22076

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Problem statement:

By using the concept of equation of a line, prove that the three points (3, 0), (-2, -2) and (8, 2) are collinear.

Construction

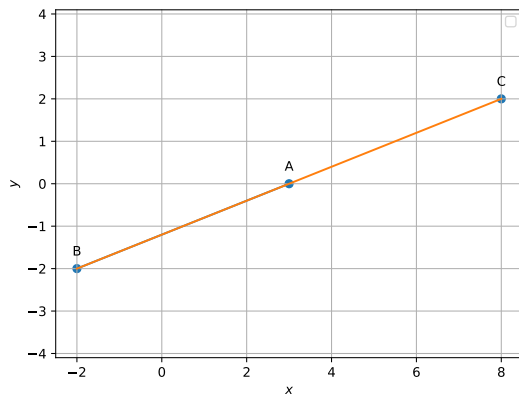


Figure of construction

The input parameters for this construction are

Symbol	Value	Description
A	$\begin{pmatrix} 3 \\ 0 \end{pmatrix}$	collinear point
B	$\begin{pmatrix} -2 \\ -2 \end{pmatrix}$	collinear point
C	$\begin{pmatrix} 8 \\ 2 \end{pmatrix}$	collinear point

Solution

Statement: the rank of matrix defines number of linearly dependent vectors.

$$\mathbf{D} = \mathbf{A} - \mathbf{B} \quad (1)$$

$$= \begin{pmatrix} 3 \\ 0 \end{pmatrix} - \begin{pmatrix} -2 \\ -2 \end{pmatrix} \quad (2)$$

$$= \begin{pmatrix} -5 \\ -2 \end{pmatrix} \quad (3)$$

$$\mathbf{E} = \mathbf{A} - \mathbf{C} \quad (4)$$

$$= \begin{pmatrix} 8 \\ 2 \end{pmatrix} - \begin{pmatrix} 3 \\ 0 \end{pmatrix} \quad (5)$$

$$= \begin{pmatrix} 5 \\ 2 \end{pmatrix} \quad (6)$$

Now the matrix is:

$$\mathbf{F} = (\mathbf{D} \quad \mathbf{E}) \quad (7)$$

$$= \begin{pmatrix} -5 & -2 \\ 5 & 2 \end{pmatrix} \quad (8)$$

Through pivoting, we obtain

$$= \begin{pmatrix} -5 & -2 \\ 5 & 2 \end{pmatrix} \quad (9)$$

$$\xleftrightarrow{R_2 \leftarrow -R_1 + R_2} = \begin{pmatrix} -5 & -2 \\ 0 & 0 \end{pmatrix} \quad (10)$$

From the above rank of matrix is 1

If rank of matrix F is "1" then the vectors are in linearly dependent. so points are in collinear.