Assignment - Vector-3

Surajit Sarkar

भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

Contents

I. Problem

In each of the following, find the value of 'k', for which the points are collinear.

(i) (7, –2), (5, 1), (3, k)
(ii) (8, 1), (k, –4), (2, –5)

II. Solution

(i) Given

$$\mathbf{A} = \begin{pmatrix} 7 \\ -2 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 5 \\ 1 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 3 \\ k \end{pmatrix} \tag{1}$$

Then

$$(\mathbf{A} - \mathbf{B}) = \begin{pmatrix} 2 \\ -3 \end{pmatrix} \tag{2}$$

$$(\mathbf{A} - \mathbf{C}) = \begin{pmatrix} 4 \\ -2 - k \end{pmatrix} \tag{3}$$

Forming the collinearity matrix

$$\begin{pmatrix} 2 & -3 \\ 4 & 2k \end{pmatrix} \xleftrightarrow{R_2 = R_2 - R_1} \begin{pmatrix} 2 & -3 \\ 0 & -k+4 \end{pmatrix} \tag{4}$$

$$k = 4 \tag{5}$$

(ii) Given

$$\mathbf{A} = \begin{pmatrix} 8 \\ 1 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} k \\ -4 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 2 \\ -5 \end{pmatrix} \tag{6}$$

Then

$$(\mathbf{A} - \mathbf{B}) = \begin{pmatrix} -8k \\ 5 \end{pmatrix} \tag{7}$$

$$(\mathbf{A} - \mathbf{C}) = \begin{pmatrix} 6 \\ 6 \end{pmatrix} \tag{8}$$

Forming the collinearity matrix

$$\begin{pmatrix} -8k & 5 \\ 6 & 6 \end{pmatrix} \xleftrightarrow[R_2 = R_2 - 6R_1]{R_1 = \frac{R_1}{8-k}} \begin{pmatrix} 1 & \frac{5}{8-k} \\ 0 & 6 - \frac{30}{8-k} \end{pmatrix} \tag{9}$$

$$k = 3 \tag{10}$$

III. Code Link

(i)

https://github.com/sssurajit/fwc/blob/main/vectors/10.7.3.2/codes/vector–1.py

Execute the code by using the command **python3 vector-1.py**

(ii)

https://github.com/sssurajit/fwc/blob/main/vectors/10.7.3.2/codes/vector–2.py

Execute the code by using the command **python3 vector-2.py**

IV. Figure

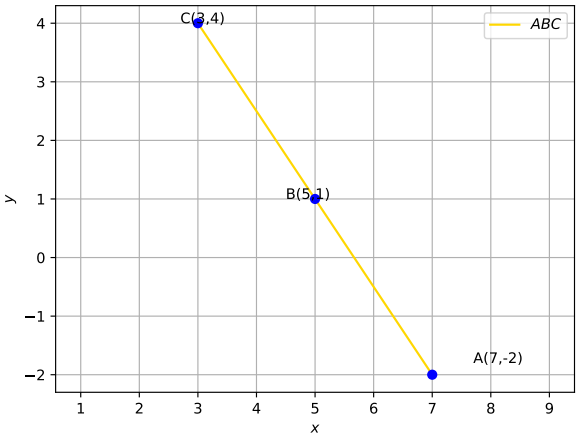

Fig. 1

(i)
(ii)

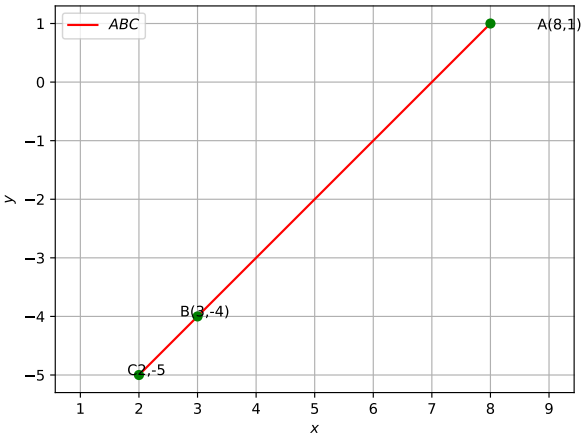

Fig. 2