

1.6.15

EE25BTECH11065 - Yoshita

Question:

Find the value of m if the points $(5, 1)$, $(-2, -3)$ and $(8, 2m)$ are collinear.

Solution:

Let $\mathbf{A}(5, 1)$, $\mathbf{B}(-2, -3)$, $\mathbf{C}(8, 2m)$.

Using the collinearity (*rank*) test, form the matrix with difference vectors:

$$\begin{aligned} (\mathbf{B} - \mathbf{A} \quad \mathbf{C} - \mathbf{A}) &= \begin{pmatrix} -2 - 5 & 8 - 5 \\ -3 - 1 & 2m - 1 \end{pmatrix} \\ &= \begin{pmatrix} -7 & 3 \\ -4 & 2m - 1 \end{pmatrix}. \end{aligned}$$

The three points are collinear \iff this matrix has rank 1
(its rows are linearly dependent).

$$R_2 \leftarrow 7R_2 - 4R_1 \implies \begin{pmatrix} -7 & 3 \\ 0 & 14m - 19 \end{pmatrix}.$$

For rank 1, the second row must be zero:

$$14m - 19 = 0 \implies m = \frac{19}{14}$$

See Fig. 0 ,

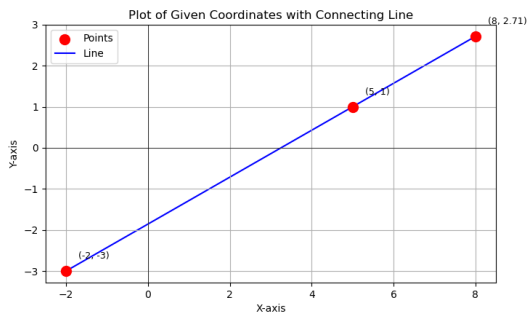


Fig. 0