2.9.20

AI25BTECH11004-B.JASWANTH

Question

X and **Y** are two points with position vectors 3**a**+**b** and **a**-3**b**, respectively. Write the position vector of a point Z which divides the line segment **XY** in the ratio 2:1 externally.

Solution:

Given,

$$\mathbf{X} = \begin{pmatrix} 3\mathbf{a} \\ \mathbf{b} \end{pmatrix}, \mathbf{Y} = \begin{pmatrix} \mathbf{a} \\ -3\mathbf{b} \end{pmatrix} \tag{0.1}$$

If **Z** divides XY in the ratio k:1 externally,Then

$$\mathbf{Z} = \frac{k\mathbf{Y} - \mathbf{X}}{k - 1} \tag{0.2}$$

So,

$$\mathbf{Z} = \frac{2\mathbf{Y} - \mathbf{X}}{1} \tag{0.3}$$

$$\mathbf{Z} = \begin{pmatrix} \mathbf{X} & \mathbf{Y} \end{pmatrix} \begin{pmatrix} -1 \\ 2 \end{pmatrix} \tag{0.4}$$

$$= \begin{pmatrix} 3\mathbf{a} & \mathbf{a} \\ \mathbf{b} & -3\mathbf{b} \end{pmatrix} \begin{pmatrix} -1 \\ 2 \end{pmatrix} = \begin{pmatrix} -\mathbf{a} \\ -7\mathbf{b} \end{pmatrix} \tag{0.5}$$

Therefore,

$$\mathbf{Z} = \begin{pmatrix} -\mathbf{a} \\ -7\mathbf{b} \end{pmatrix} \tag{0.6}$$

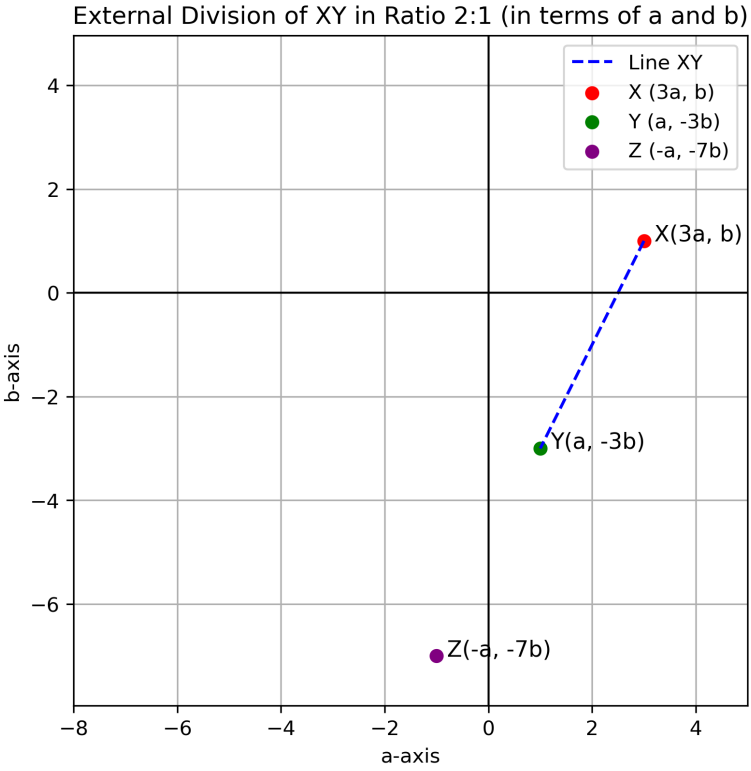

Fig. 0: Caption