4.11.10

EE25BTECH11032 - Kartik Lahoti

Question:

Point **A** lies on the line segment **XY** joining **X** $(6, -6)$ and **Y** $(-4, -1)$ in such a way that $\frac{\mathbf{XA}}{\mathbf{XY}} = \frac{2}{5}$. if point **A** also lies on the line $3x + k(y + 1) = 0$, find the value of k.

Solution:

Given :

Symbol	Value	Description
X	$\begin{pmatrix} 6 \\ -6 \end{pmatrix}$	Given Point
Y	$\begin{pmatrix} -4 \\ -1 \end{pmatrix}$	Given Point
A	?	Desired Point

$$\frac{\mathbf{XA}}{\mathbf{XY}} = \frac{2}{5} \tag{0.1}$$

$$\frac{\mathbf{XA}}{\mathbf{XY} - \mathbf{XA}} = \frac{2}{5 - 2} \tag{0.2}$$

$$\frac{\mathbf{XA}}{\mathbf{YA}} = \frac{2}{3} \tag{0.3}$$

Using Section Formula,

$$\mathbf{A} = \frac{1}{1 + \frac{2}{3}} \left(\begin{pmatrix} 6 \\ -6 \end{pmatrix} + \frac{2}{3} \begin{pmatrix} -4 \\ -1 \end{pmatrix} \right) = \begin{pmatrix} 2 \\ -4 \end{pmatrix} \tag{0.4}$$

Given Line Equation,

$$\begin{pmatrix} 3 & k \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} + k = 0 \tag{0.5}$$

Putting **A** in this equation,

$$\begin{pmatrix} 3 & k \end{pmatrix} \begin{pmatrix} 2 \\ -4 \end{pmatrix} + k = 0 \tag{0.6}$$

$$6 - 4k + k = 0 \tag{0.7}$$

$$k = 2 \tag{0.8}$$

Hence,

$$\mathbf{A} = \begin{pmatrix} 2 \\ -4 \end{pmatrix} \text{ and } k = 2 \tag{0.9}$$