5.3.6 Matgeo

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Question

If the pair of equations 3x - y + 8 = 0 and 6x - ry + 16 = 0 represents coincident lines, then the value of r is

Solution

Let :

$$r_1 = \begin{bmatrix} 3 & -1 \end{bmatrix} \mathbf{x} = -8 \tag{1}$$

$$r_2 = \begin{bmatrix} 6 & -r \end{bmatrix} \mathbf{x} = -16 \tag{2}$$

For coincident lines:

$$r_2 = \kappa r_1 \tag{3}$$

Solution

Solving using above equation

$$\begin{bmatrix} 6 & -r \end{bmatrix} \mathbf{x} + 16 = \kappa(\begin{bmatrix} 3 & -1 \end{bmatrix} \mathbf{x} + 8) \tag{4}$$

$$= \begin{bmatrix} 3\kappa & -1\kappa \end{bmatrix} \mathbf{x} + 8\kappa \tag{5}$$

By comparing we get :

$$\kappa = 2 \tag{6}$$

$$\begin{bmatrix} 6 & -r \end{bmatrix} \mathbf{x} + 16 = \begin{bmatrix} 6 & -2 \end{bmatrix} \mathbf{x} + 16 \tag{7}$$

Solution

since LHS should be equal to RHS :

$$r = 2 \tag{8}$$

Graphical Representation