

1 Problem statement

Find the equation of line parallel to the y axis drawn through the point of intersection of the lines $1 - 7\vec{x} = -5$ and $31\vec{x} = 0$

2 Theory

consider the equation of the system

$$x - 7y = -5 ; 3x + y = 0$$

now forming matrix equation

$$AX = B$$

$$A = \begin{bmatrix} 1 & -7 \\ 3 & 1 \end{bmatrix} \text{ be a full-rank}$$

2x2 matrix. Then $\det A \equiv |A| = 1 \times 1 - 3 \times 7 = 21$ and

$$A^{-1} = \begin{bmatrix} 1 & -7 \\ 3 & 1 \end{bmatrix}^{-1} = \frac{1}{|21|} \begin{bmatrix} 1 & 7 \\ -3 & 1 \end{bmatrix}.$$

$$X = \begin{bmatrix} x \\ y \end{bmatrix}$$

$$B = \begin{bmatrix} -5 \\ 0 \end{bmatrix}$$

$$X = A^{-1}B$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{|21|} \begin{bmatrix} 1 & 7 \\ -3 & 1 \end{bmatrix} \begin{bmatrix} -5 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \frac{-5}{21} \\ \frac{15}{21} \end{bmatrix}$$

$$x = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} \frac{-5}{21} \\ \frac{15}{21} \end{bmatrix} = \frac{-5}{21}$$

the required equation of line parallel to y - axis ; $\vec{x} = \frac{-5}{21}$