Excercise 10.4

Q6. Find the equation of the line parallel to y-axis and drawn through the point of intersection of the lines x − 7y + 5 = 0 and 3x + y = 0.

Solution

The given line equations represented in vector form:

$$\begin{pmatrix} 1 & -7 \end{pmatrix} \mathbf{x} = -5 \tag{1}$$

$$\begin{pmatrix} 3 & 1 \end{pmatrix} \mathbf{x} = 0 \tag{2}$$

$$\tag{3}$$

The intersection of two lines is given by:

$$\begin{pmatrix} 1 & -7 & 5 \\ 3 & 1 & 0 \end{pmatrix} \mathbf{x} = 0 \tag{4}$$

$$\begin{pmatrix} 1 & -7 & 5 \\ 3 & 1 & 0 \end{pmatrix} \xleftarrow{R_2 = R_2 - 3R_1} \begin{pmatrix} 1 & -7 & 5 \\ 0 & 22 & -15 \end{pmatrix} \mathbf{x} = 0 \tag{5}$$

$$\xleftarrow{R_2 = \frac{R_2}{22}} \begin{pmatrix} 1 & -7 & 5 \\ 0 & 1 & -\frac{15}{22} \end{pmatrix} \mathbf{x} = 0 \tag{6}$$

$$\xleftarrow{R_1 = R_1 + 7R_2} \begin{pmatrix} 1 & 0 & \frac{5}{22} \\ 0 & 1 & \frac{-15}{22} \end{pmatrix} \mathbf{x} = 0 \tag{7}$$

From (7), we get two equations which is

$$\mathbf{x} = \begin{pmatrix} -\frac{5}{22} \\ \frac{15}{22} \end{pmatrix} \tag{8}$$

$$x = -\frac{5}{22}, y = \frac{15}{22} \tag{9}$$

The equation of line parallel to y-axis is given from x=$-\frac{5}{22}$:

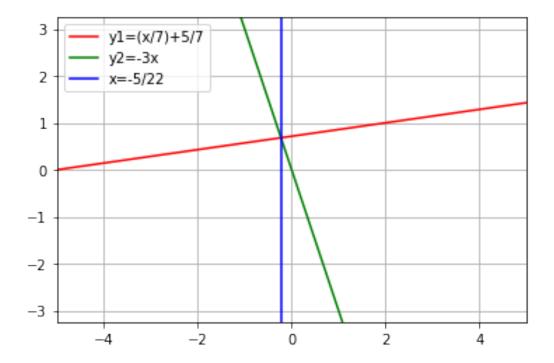$$\begin{pmatrix} 1 & 0 \end{pmatrix} \mathbf{x} = -\frac{5}{22} \tag{10}$$

Figure 1: