5.2.5

EE25BTECH11002 - Achat Parth Kalpesh

Question:
Solve the following system of linear equation

$$3x + 2y = 5 \tag{0.1}$$
$$2x - 3y = 7 \tag{0.2}$$

Solution:
The above equation can be written as

$$\begin{pmatrix} 3 & 2 \\ 2 & -3 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 5 \\ 7 \end{pmatrix} \tag{0.3}$$

Performing row operations:

$$\left(\begin{array}{cc|c} 3 & 2 & 5 \\ 2 & -3 & 7 \end{array}\right) \xleftrightarrow{R_1 \leftarrow \frac{R_1}{3}} \left(\begin{array}{cc|c} 1 & \frac{2}{3} & \frac{5}{3} \\ 2 & -3 & 7 \end{array}\right) \tag{0.4}$$

$$\left(\begin{array}{cc|c} 1 & \frac{2}{3} & \frac{5}{3} \\ 2 & -3 & 7 \end{array}\right) \xleftrightarrow{R_2 \leftarrow R_2 - 2R_1} \left(\begin{array}{cc|c} 1 & \frac{2}{3} & \frac{5}{3} \\ 0 & -\frac{13}{3} & \frac{11}{3} \end{array}\right) \tag{0.5}$$

$$\left(\begin{array}{cc|c} 1 & \frac{2}{3} & \frac{5}{3} \\ 0 & -\frac{13}{3} & \frac{11}{3} \end{array}\right) \xleftrightarrow{R_2 \leftarrow -\frac{3}{13}R_2} \left(\begin{array}{cc|c} 1 & \frac{2}{3} & \frac{5}{3} \\ 0 & 1 & -\frac{11}{13} \end{array}\right) \tag{0.6}$$

$$\left(\begin{array}{cc|c} 1 & \frac{2}{3} & \frac{5}{3} \\ 0 & 1 & -\frac{11}{13} \end{array}\right) \xleftrightarrow{R_1 \leftarrow R_1 - \frac{2}{3}R_2} \left(\begin{array}{cc|c} 1 & 0 & \frac{29}{13} \\ 0 & 1 & -\frac{11}{13} \end{array}\right) \tag{0.7}$$

Thus,

$$\mathbf{x} = \begin{pmatrix} \frac{29}{13} \\ -\frac{11}{13} \end{pmatrix} \tag{0.8}$$

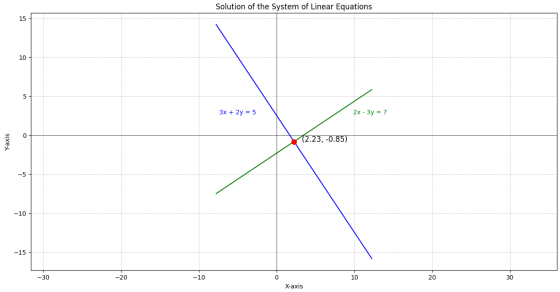

Fig. 0.1: Graph