5.3.17

AI25BTECH11023 - Pratik R

QUESTION

Solve the system of linear equations using the matrix method

$$7x + 2y = 11 \tag{0.1}$$
$$4x - 7y = 2 \tag{0.2}$$

Solution:

Using augmented matrix

$$\begin{pmatrix} 7 & 2 & \bigg| & 11 \\ 4 & -7 & \bigg| & 2 \end{pmatrix} \tag{0.3}$$

Reducing it to reduced echelon form

$$\begin{pmatrix} 7 & 2 & \bigg| & 11 \\ 4 & -7 & \bigg| & 2 \end{pmatrix} \xrightarrow{R_2 = R_2 - R_1 \times \frac{4}{7}} \begin{pmatrix} 7 & 2 & \bigg| & 11 \\ 0 & -\frac{57}{7} & \bigg| & -\frac{30}{7} \end{pmatrix} \tag{0.4}$$

$$\xrightarrow{R_2 = R_2 \times \frac{14}{57}} \begin{pmatrix} 7 & 2 & \bigg| & 11 \\ 0 & -2 & \bigg| & -\frac{60}{57} \end{pmatrix} \xrightarrow{R_1 = R_1 + R_2} \begin{pmatrix} 7 & 0 & \bigg| & \frac{567}{57} \\ 0 & -2 & \bigg| & -\frac{60}{57} \end{pmatrix} \tag{0.5}$$

$$\xrightarrow{R_1 = R_1/7} \begin{pmatrix} 1 & 0 & \bigg| & \frac{81}{57} \\ 0 & -2 & \bigg| & -\frac{60}{57} \end{pmatrix} \xrightarrow{R_2 = R_2/-2} \begin{pmatrix} 1 & 0 & \bigg| & \frac{81}{57} \\ 0 & 1 & \bigg| & \frac{30}{57} \end{pmatrix} \tag{0.6}$$

Hence

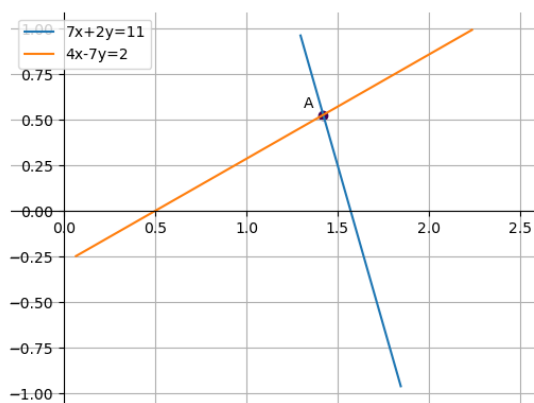$$\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{57} \begin{pmatrix} 81 \\ 30 \end{pmatrix} \tag{0.7}$$

Fig. 0.1: graph