5.3.17

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Question

Solve the system of linear equations using the matrix method

$$7x + 2y = 11 \tag{1}$$

$$4x - 7y = 2 \tag{2}$$

Solution

Using augmented matrix

$$\left(\begin{array}{cc|c} 7 & 2 & 11 \\ 4 & -7 & 2 \end{array}\right) \tag{3}$$

Reducing it to reduced echelon form

$$\left(\begin{array}{cc|c} 7 & 2 & 11 \\ 4 & -7 & 2 \end{array}\right) \xleftrightarrow{R_2 = R_2 - \frac{4}{7}R_1} \left(\begin{array}{cc|c} 7 & 2 & 11 \\ 0 & -\frac{57}{7} & -\frac{30}{7} \end{array}\right) \tag{4}$$

Solution

$$\xleftrightarrow{R_2=\frac{14}{57}R_2} \left(\begin{array}{cc|c} 7 & 2 & 11 \\ 0 & -2 & -\frac{60}{57} \end{array}\right) \xleftrightarrow{R_1=R_1+R_2} \left(\begin{array}{cc|c} 7 & 0 & \frac{567}{57} \\ 0 & -2 & -\frac{60}{57} \end{array}\right) \tag{5}$$

$$\xleftrightarrow{R_1=R_1/7} \left(\begin{array}{cc|c} 1 & 0 & \frac{81}{57} \\ 0 & -2 & -\frac{60}{57} \end{array}\right) \xleftrightarrow{R_2=R_2/-2} \left(\begin{array}{cc|c} 1 & 0 & \frac{81}{57} \\ 0 & 1 & \frac{30}{57} \end{array}\right) \tag{6}$$

Solution

Hence

$$\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{57} \begin{pmatrix} 81 \\ 30 \end{pmatrix} \tag{7}$$

plot