

5.2.30

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Question. Solve the following system of linear equations.

$$7x - 15y = 2$$

$$x + 2y = 3$$

Solution:

Let us solve the given equation theoretically and then verify the solution computationally.

The given equation can be written as:

$$\begin{pmatrix} 7 & -15 \\ 1 & 2 \end{pmatrix} \mathbf{x} = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \quad (1)$$

$$\left(\begin{array}{cc|c} 7 & -15 & 2 \\ 1 & 2 & 3 \end{array} \right) \xleftrightarrow{R_2 \leftarrow R_2 - \frac{1}{7}R_1} \left(\begin{array}{cc|c} 7 & -15 & 2 \\ 0 & \frac{29}{7} & \frac{19}{7} \end{array} \right) \quad (2)$$

$$\left(\begin{array}{cc|c} 7 & -15 & 2 \\ 0 & \frac{29}{7} & \frac{19}{7} \end{array} \right) \xleftrightarrow{\begin{array}{l} R_2 \leftarrow \frac{7}{29}R_2 \\ R_1 \leftarrow \frac{1}{7}R_1 \end{array}} \left(\begin{array}{cc|c} 1 & \frac{-15}{7} & \frac{2}{7} \\ 0 & 1 & \frac{19}{29} \end{array} \right) \quad (3)$$

$$\left(\begin{array}{cc|c} 1 & \frac{-15}{7} & \frac{2}{7} \\ 0 & 1 & \frac{19}{29} \end{array} \right) \xleftrightarrow{R_1 \leftarrow R_1 + \frac{15}{7}R_2} \left(\begin{array}{cc|c} 1 & 0 & \frac{49}{29} \\ 0 & 1 & \frac{19}{29} \end{array} \right) \quad (4)$$

From this we can say that:

$$\mathbf{x} = \begin{pmatrix} \frac{49}{29} \\ \frac{19}{29} \end{pmatrix} \quad (5)$$

From the figure it is clearly verified that the theoretical solution matches with the computational solution.

