Pair of linear equation in two variables

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Class 10th Maths - Chapter 3

This is Problem-1 from Exercise 3.4

1. Solve the following pair of linear equations by elimination method and substitution method:

$$x + y = 5 \tag{1}$$
$$2x - 3y = 4 \tag{2}$$

Solution:
Equation can be written as:

$$\begin{pmatrix} 1 & 1 \\ 2 & -3 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 5 \\ 4 \end{pmatrix} \tag{3}$$

$R_1 \to R_2 - 2R_1$
we get,

$$\begin{pmatrix} 1 & 1 \\ 0 & -5 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 5 \\ -6 \end{pmatrix} \tag{4}$$

$R_1 \to R_2 - 5R_1$

$$\begin{pmatrix} -5 & 0 \\ 0 & -5 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -3 \\ -6 \end{pmatrix} \tag{5}$$

$$\tag{6}$$

$R_1 \rightarrow \frac{R_1}{-5}; R_2 \rightarrow \frac{R_2}{-5}$

$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} \frac{-19}{-5} \\ \frac{-6}{-5} \end{pmatrix} \tag{7}$$

$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} \frac{19}{5} \\ \frac{6}{5} \end{pmatrix} \tag{8}$$

Since, The values of $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$
Hence It is a consistent equation and have unique solution