Pair of linear equation in two variables

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Class 10^{th} 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:

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

$$x = \frac{\begin{vmatrix} \mathbf{b} & \mathbf{a_2} \end{vmatrix}}{\begin{vmatrix} \mathbf{a_1} & \mathbf{a_2} \end{vmatrix}} = \frac{\begin{vmatrix} 5 & 4 \\ 1 & -3 \end{vmatrix}}{\begin{vmatrix} 1 & 2 \\ 1 & -3 \end{vmatrix}} = \frac{(5)(-3) - (1)(4)}{(1)(-3) - (1)(2)} = \frac{19}{5} \tag{4}$$

$$y = \frac{\begin{vmatrix} \mathbf{a_1} & \mathbf{b} \end{vmatrix}}{\begin{vmatrix} \mathbf{a_1} & \mathbf{a_2} \end{vmatrix}} = \frac{\begin{vmatrix} 1 & 2 \\ 5 & 4 \end{vmatrix}}{\begin{vmatrix} 1 & 2 \\ 1 & -3 \end{vmatrix}} = \frac{(1)(4) - (5)(2)}{(1)(-3) - (1)(2)} = \frac{6}{5} \tag{5}$$

x and y are consistent and have unique solution.