Linear equations in 2 variables

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Class 10th Maths - Chapter 3

This is Problem-2.3 from Exercise 3.2

1. On comparing the ratios $\frac{a_1}{a_2}$, $\frac{b_1}{b_2}$, $\frac{c_1}{c_2}$, find out whether the lines representing the following pairs of linear equations intersect at a point, are parallel or coincident:

$$6x{-}3y + 10 = 0 \tag{1}$$
$$2x{-}y + 9 = 0 \tag{2}$$

Solution:
Equations can be written as:

$$\begin{vmatrix} 6 & -3 \\ 2 & -1 \end{vmatrix} \begin{vmatrix} x \\ y \end{vmatrix} = \begin{vmatrix} 10 \\ 9 \end{vmatrix} \tag{3}$$

$$x = \frac{(\mathbf{B} \times \mathbf{A_2})}{\mathbf{A_1} \times \mathbf{A_2}} = \frac{\begin{vmatrix} 10 & -3 \\ 9 & -1 \end{vmatrix}}{\begin{vmatrix} 6 & -3 \\ 2 & -1 \end{vmatrix}} = \frac{(-1)(10) - (9)(-3)}{(-1)(6) - (2)(-3)} = \frac{-10 + 27}{-6 + 6} = 17 \tag{4}$$

$$y = \frac{(\mathbf{A_1} \times \mathbf{B})}{\mathbf{A_1} \times \mathbf{A_2}} = \frac{\begin{vmatrix} 6 & 10 \\ 2 & 9 \end{vmatrix}}{\begin{vmatrix} 6 & -3 \\ 2 & -1 \end{vmatrix}} = \frac{9(6) - 2(10)}{-1(6) - 2(-3)} = \frac{54 - 20}{-6 + 6} = 34 \tag{5}$$

$$\tag{6}$$

As the values of x and y are same and
Since the value of x and y are not satisfying so

$$= \frac{a1}{a2} \tag{7}$$

$$= \frac{b1}{b2} \tag{8}$$

$$= \frac{c1}{c2} \tag{9}$$

$$\tag{10}$$

where the values of the above are

$$a1 = 6, b1 = -3, c1 = 10 \tag{11}$$
$$a2 = 2, b2 = -1, c2 = 9 \tag{12}$$
$$\tag{13}$$

Since $\frac{a1}{a2} = \frac{b1}{b2} notequalto \frac{c1}{c2}$

So, the pairs of equations given in the question are parallel to each other and the lines never intersect each other at any point, and there is no possible solution for the given pair of equations.