

System of Equations

Determine the nature of the solution to each system of linear equations. If the system has a solution, find it algebraically,

$$1. \begin{cases} y = \frac{3}{7}x - 8 \\ 3x - 7y = 1 \end{cases}$$

$$2. \begin{cases} 2x - 5 = y \\ -3x - 1 = 2y \end{cases}$$

$$3. \begin{cases} x = 6y + 7 \\ x = 10y + 2 \end{cases}$$

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1.
$$\begin{cases} y = \frac{3}{7}x - 8 \\ 3x - 7y = 1 \end{cases}$$

The slopes of these two equations are the same, and the y-intercept points are different, which means they graph as parallel lines. Therefore, this system will have no solution.

2.
$$\begin{cases} 2x - 5 = y \\ -3x - 1 = 2y \end{cases}$$

$$\begin{aligned} (2x - 5 = y)2 \\ 4x - 10 = 2y \\ \begin{cases} 4x - 10 = 2y \\ -3x - 1 = 2y \end{cases} \\ 4x - 10 = -3x - 1 \\ 7x - 10 = -1 \\ 7x = 9 \\ x = \frac{9}{7} \end{aligned}$$

$$y = 2\left(\frac{9}{7}\right) - 5$$

$$y = \frac{18}{7} - 5$$

$$y = -\frac{17}{7}$$

The solution is $\left(\frac{9}{7}, -\frac{17}{7}\right)$.

3.
$$\begin{cases} x = 6y + 7 \\ x = 10y + 2 \end{cases}$$

$$\begin{aligned} 6y + 7 = 10y + 2 \\ 7 = 4y + 2 \\ 5 = 4y \\ \frac{5}{4} = y \end{aligned}$$

$$x = 6\left(\frac{5}{4}\right) + 7$$

$$x = \frac{15}{2} + 7$$

$$x = \frac{29}{2}$$

The solution is $\left(\frac{29}{2}, \frac{5}{4}\right)$.