

System of Equations

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

$$1. \begin{cases} 5y = \frac{15}{4}x + 25 \\ y = \frac{3}{4}x + 5 \end{cases}$$

$$2. \begin{cases} x + 9 = y \\ x = 4y - 6 \end{cases}$$

$$3. \begin{cases} 3y = 5x - 15 \\ 3y = 13x - 2 \end{cases}$$

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$$1. \begin{cases} 5y = \frac{15}{4}x + 25 \\ y = \frac{3}{4}x + 5 \end{cases}$$

These equations define the same line. Therefore, this system will have infinitely many solutions.

$$2. \begin{cases} x + 9 = y \\ x = 4y - 6 \end{cases}$$

$$\begin{aligned} 4y - 6 + 9 &= y \\ 4y + 3 &= y \\ 3 &= -3y \\ -1 &= y \end{aligned}$$

$$\begin{aligned} x + 9 &= -1 \\ x &= -10 \end{aligned}$$

The solution is $(-10, -1)$.

$$3. \begin{cases} 3y = 5x - 15 \\ 3y = 13x - 2 \end{cases}$$

$$\begin{aligned} 5x - 15 &= 13x - 2 \\ -15 &= 8x - 2 \\ -13 &= 8x \\ -\frac{13}{8} &= x \end{aligned} \quad \begin{aligned} 3y &= 5\left(-\frac{13}{8}\right) - 15 \\ 3y &= -\frac{65}{8} - 15 \\ 3y &= -\frac{185}{8} \\ y &= -\frac{185}{24} \end{aligned}$$

The solution is $\left(-\frac{13}{8}, -\frac{185}{24}\right)$.

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