

Systems of Equations

I When one has two variables in an equation then two equations are needed to solve for the "solution" to the system. Recall the solution is the intersection point of the two lines:

Two methods for solving

Elimination: Remove one variable by addition/subtraction

e.g. 1

$$\begin{array}{l} \textcircled{1} -3x + 3y = 3 \\ \textcircled{2} (-5x + y = 13) \times -3 \end{array}$$

eliminate "y"

$$(-3, -2)$$

$$\begin{array}{l} \textcircled{1} -3x + 3y = 3 \\ \text{ADD } \textcircled{2} 15x - 3y = -39 \\ \hline 12x = -36 \\ 12x = -36 \\ x = -3 \end{array}$$

eliminated

$$\begin{array}{l} \textcircled{2} -5x + y = 13 \\ -5(-3) + y = 13 \\ 15 + y = 13 \\ y = -2 \end{array}$$

ii) Substitution: Solve for 1 variable and then put the expression into the other eqn.

e.g. ① $-2x - y = -9$... $y = ??$

② $5x - 2y = 18$...

Solve for y in eqn # 1 ① $-2x - y = -9$

$$-y = -9 + 2x$$

$$y = 9 - 2x$$

now substitution

$$\begin{array}{l} \textcircled{2} 5x - 2y = 18 \\ 5x - 2(9 - 2x) = 18 \\ 5x + 4x - 18 = 18 \quad (4, 1) \\ 9x = 36 \\ x = 4 \end{array}$$

don't forget to substitute again!!

$$\begin{aligned} -2x + 9 &= y \\ -2(4) + 9 &= y \\ -8 + 9 &= y \\ 1 &= y \end{aligned}$$

Try this: $-2x + 6y = 6$ solve the system

$$-7x + 8y = -5$$