

Solving Systems of Equations

2 or more equations

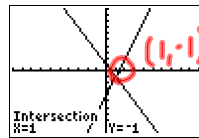
- 2 unknowns ↔ 2 equations (2x2)
- 3 unknowns ↔ 3 equations (3x3)
- 4 unknowns ↔ 4 equations (4x4)

When solving a system, we are looking for a solution that satisfies all equations.

Example 1 - Solving by Graphing

Solve: $\begin{cases} \textcircled{1} y = 3x - 4 \\ \textcircled{2} y = -2x + 1 \end{cases}$ } intersection pt is the solution.

Solution (1, -1)



Example 2 - Solve using Substitution

\textcircled{A} $\begin{cases} \textcircled{1} y = 3x - 4 \\ \textcircled{2} y = -2x + 1 \end{cases}$ } $\begin{matrix} +2x & +2x \\ 3x - 4 = -2x + 1 \\ 5x - 4 = 1 & +4 \\ 5x = 5 \\ x = 1 \end{matrix}$ Sub $x=1$ into $\textcircled{1}$

Solution is (1, -1)

$\begin{matrix} y = 3x - 4 \\ y = 3(1) - 4 \\ y = 3 - 4 \\ y = -1 \end{matrix}$

\textcircled{B} $\begin{cases} \textcircled{1} 2x + y = 7 \\ \textcircled{2} 3x + 2y = 0 \end{cases}$ → rearrange to get y by itself

$\textcircled{1} 2x + y = 7$
 $y = 7 - 2x$ sub into $\textcircled{2}$

$\textcircled{2} 3x + 2y = 0$
 $3x + 2(7 - 2x) = 0$
 $3x + 14 - 4x = 0$
 $-x + 14 = 0$
 $-x = -14$
 $x = 14$

Sub $x=14$ in $\textcircled{1}$ rearranged:
 $y = 7 - 2x$
 $y = 7 - 2(14)$
 $y = 7 - 28$
 $y = -21$

The solution is (14, -21)

Example 3 - Solving using Elimination

(A) ① $2(2x + y = 7)$ \Rightarrow $4x + 2y = 14$
 ② $3x - 2y = 7$ \Rightarrow $3x - 2y = 7$ \leftarrow ADD

$$\begin{array}{r} 4x + 2y = 14 \\ 3x - 2y = 7 \\ \hline 7x = 21 \\ \frac{7}{7} = \frac{21}{7} \\ \boxed{x = 3} \end{array}$$

Sub $x = 3$ into ①

$$2x + y = 7$$

$$2(3) + y = 7$$

$$6 + y = 7$$

$$\boxed{y = 1}$$

solution
(3, 1)

(B) ① $2(5x + 3y = 11)$ \Rightarrow $10x + \cancel{6y} = 22$
 ② $3(4x - 2y = 22)$ \Rightarrow $12x - \cancel{6y} = 66$ ADD

$$\begin{array}{r} 10x + \cancel{6y} = 22 \\ 12x - \cancel{6y} = 66 \\ \hline 22x = 88 \\ \frac{22}{22} = \frac{88}{22} \\ \boxed{x = 4} \end{array}$$

Sub $x = 4$ into ②

$$4x - 2y = 22$$

$$4(4) - 2y = 22$$

$$16 - 2y = 22$$

$$\frac{-2y}{-2} = \frac{6}{-2}$$

$$\boxed{y = -3}$$

The solution is
(4, -3)
(x, y)

Example 4 . Application .

Phone Bill:

	LD(NS)	LD(other)	Total Bill
Sept	210 min	40 min	\$ 41.50
Oct	150 min	55 min	\$ 36.25
Nov	100 min	90 min	\$ 37.50

What is the cost per minute for LD(NS) and LD(other)

let x be the cost per minute for LD(NS)
 let y be the cost per minute for LD(other)

Sept: $210x + 40y = 41.50$

Oct: $150x + 55y = 36.25$

Nov: $100x + 90y = 37.50$

Annotations:
 - $210x$ is circled in red, with an arrow pointing to "cost for LD(NS)"
 - $40y$ is circled in green, with an arrow pointing to "cost for LD(other)"
 - 41.50 is circled in green, with an arrow pointing to "total cost"

Pick any 2 equations and solve the system.

To DO

① Sheet

② TEXT: p31/28a+b
 p32/31