

Algebra 1: 5.2 Solving Systems using Substitution

Ex: Solve the system...

 Eq^n : Equation

$$\begin{aligned} 3x - 5y &= 13 \\ -2x &= 8 \end{aligned}$$

Solve the 2nd Eqⁿ for x.

$$\frac{-2x}{-2} = \frac{8}{-2}$$

$$x = -4$$

"Substitute" -4 for x on 1st Eqⁿ

$$3(-4) - 5y = 13 \quad \leftarrow \text{solve.}$$

$$\begin{aligned} -12 - 5y &= 13 \\ +12 & \quad +12 \end{aligned}$$

$$\frac{-5y}{-5} = \frac{25}{-5}$$

$$y = -5$$

see how the second equation doesn't even have a y? we don't want to do that by graphing.

Goal:

write an ordered pair (x, y)

Answer:
(-4, -5)

5.2 - Solving Systems by Substitution

Ex: Solve

$$y = -2x - 9$$

Substitute what y equals into the second equation.

$$6x - 5y = -19$$

$$6x - 5(-2x - 9) = -19 \quad \text{solve.}$$

$$6x + 10x + 45 = -19 \quad \text{combine like terms}$$

$$16x + 45 = -19$$
$$\begin{array}{r} 16x + 45 = -19 \\ -45 \quad -45 \\ \hline \end{array}$$

$$\frac{16x}{16} = \frac{-64}{16}$$

$$x = -4$$

We started with $y = -2x - 9$
∴ $x = -4$. So plug that in to x in

$$y = -2(-4) - 9$$
$$= 8 - 9$$
$$= -1$$

Answer: $(-4, -1)$

5.2 - Solving Systems by Substitution

In these examples, you will have to solve one of the equations for one of the variables before continuing. BE FLEXIBLE! Make a choice that makes solving easier!

In the following examples, answer these two questions?

Which variable in which equation is easiest to solve for? Why?

| Ex 1: | Ex 2: | Ex 3: |
|---|---|--|
| $x + y = -2$ $-3x + y = 6$ | $-x + y = -4$ $4x - y = 10$ | $2x - y = -5$ $3x - y = 1$ |
| <p>Any of the following: x or y in 1st Eqⁿ or y in 2nd Eqⁿ</p> <p>They are all 1 step to solve.</p> | <p>y in the 1st Eqⁿ it's 1 step.</p> | <p>I'll show how you'd solve.</p> $\begin{array}{r} 2x - y = -5 \\ -2x \quad -2x \\ \hline -y = -5 - 2x \end{array}$ <p>Flip <u>all</u> signs.</p> $y = 5 + 2x$ <p>Easiest: Either of the y's.</p> <p>it's just 1 step plus flip sign.</p> |

5.2 - Solving Systems by Substitution

Ex: Solve

$$x + y = -2$$

$$-3x + y = 6$$

Solving for y on 1st Eqⁿ

$$\begin{array}{r} x + y = -2 \\ -x \quad -x \end{array}$$

$$y = -2 - x$$

Since x & y
on 1st Eqⁿ and
 y on 2nd Eqⁿ are
all fixed for easiest,
just pick one and
do it!

Substitute that into the other Equation.

$$-3x + (-2 - x) = 6$$

$$-3x - 2 - x = 6$$

$$\begin{array}{r} -4x - 2 = 6 \\ +2 \quad +2 \end{array}$$

$$\begin{array}{r} -4x = 8 \\ \hline -4 \quad -4 \end{array}$$

$$x = -2$$

Substitute back in
to find y .

$$y = -2 - x$$

$$y = -2 - (-2)$$

$$= -2 + 2$$

$$= 0$$

Answer: $(-2, 0)$

5.2 - Solving Systems by Substitution

Homework:

Page 237

6-15