

MA 109: September 13

Systems of Equations: Solving with Substitution

Start of Class

Instructor Information

Name:

Email:

Office Hours:

Warm-up Questions

Notes

Strategy: solve an equation for one variable and plug into the other equation. You can pick either equation and either variable.

Example: Solve the following system of equations using substitution.

$$\begin{cases} y - 3x = 5 \\ 9 = -x + 4y \end{cases}$$

We will solve the first equation for y :

$$\begin{aligned} y - 3x &= 5 \\ +3x &+3x \\ \hline y &= 5 + 3x \end{aligned}$$

Now plug into the second equation:

$$\begin{aligned} 9 &= -x + 4y \\ 9 &= -x + 4(5 + 3x) \\ 9 &= -x + 20 + 12x \\ 9 &= 11x + 20 \\ -20 &\quad -20 \\ \hline -11 &= 11x \\ \hline -1 &= x \end{aligned}$$

Plug back into either equation to get the other variable

$$\begin{aligned} y &= 5 + 3x \\ y &= 5 + 3(-1) \\ y &= 5 - 3 \\ y &= 2 \end{aligned}$$

answer: $(-1, 2)$

Now, we want to check our work.

plug $x = -1$ and $y = 2$ and make sure it "works" for both equations:

$$\begin{aligned} y - 3x &\stackrel{?}{=} 5 \\ 2 - 3(-1) &\stackrel{?}{=} 5 \\ 2 + 3 &\stackrel{?}{=} 5 \\ 5 &= 5 \\ &\checkmark \end{aligned}$$

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

End of Class

Write a summary of what you learned today:

What questions do you have about the material from today?

What do you need to do between now and the next class meeting?