

Elimination Part 3 | MFM2P

Consider the following linear system.

$$\begin{aligned} 3x + 4y &= 11 \quad \textcircled{1} \\ 2x + 5y &= 12 \quad \textcircled{2} \end{aligned}$$

- Can you add or subtract the equations right away to eliminate a variable?
- Is there a way to multiply one of the equations to make variables match?

So we need to modify our elimination method one more time to help with this final case. It sure would be nice if there was some way you could change the equations to make the variables match....

KEY IDEAS:

- 1) You can multiply an equation by a #, and not change the solution
- 2) " " " BOTH EQUATIONS " " " " " " " "

Linear System: $\begin{aligned} 2(3x + 4y &= 11 \quad \textcircled{1}) \\ 3(2x + 5y &= 12 \quad \textcircled{2}) \end{aligned}$	Multiply... $\begin{aligned} \textcircled{1} &\text{ by } 2 \\ \textcircled{2} &\text{ by } 3 \end{aligned}$	New Linear System: $\begin{aligned} 6x + 8y &= 22 \quad \textcircled{1} \\ 6x + 15y &= 36 \quad \textcircled{2} \end{aligned}$
Do the Addition/Subtraction: $\begin{array}{r} -7y = -14 \\ \hline -7 \quad -7 \\ \hline y = 2 \end{array}$	Sub into equation $\textcircled{1}$ or $\textcircled{2}$ $\begin{aligned} 3x + 4(2) &= 11 \\ 3x + 8 &= 11 \\ \hline -8 \quad -8 \\ \hline 3x &= 3 \\ \hline x &= 1 \end{aligned}$	
	Solution: (1 , 2)	

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Linear System:	Multiply...	New Linear System:
$\begin{array}{l} 4(3x + 2y = 5 \text{ ①}) \\ 3(4x + 5y = 9 \text{ ②}) \end{array}$	$\begin{array}{l} \text{① by } 4 \\ \text{② by } 3 \end{array}$	$\begin{array}{l} 12x + 8y = 20 \text{ ①} \\ 12x + 15y = 27 \text{ ②} \end{array}$
Do the Addition/Subtraction:	Sub into equation ① or ②	
$\begin{array}{r} -7y = -7 \\ \hline y = 1 \end{array}$	$\begin{array}{r} 3x + 2(1) = 5 \\ 3x + 2 = 5 \\ \hline -2 \quad -2 \\ \hline 3x = 3 \\ \hline x = 1 \end{array}$	
Solution: (1 , 1)		

Linear System:	Multiply...	New Linear System:
$\begin{array}{l} 2(6x + 3y = 24 \text{ ①}) \\ 3(5x + 2y = 19 \text{ ②}) \end{array}$	$\begin{array}{l} \text{① by } 2 \\ \text{② by } 3 \end{array}$	$\begin{array}{l} 12x + 6y = 48 \\ 15x + 6y = 57 \end{array}$
Do the Addition/Subtraction:	Sub into equation ① or ②	
$\begin{array}{r} -3x = -9 \\ \hline -3 \quad -3 \end{array}$ $\boxed{x = 3}$	$\begin{array}{r} 5(3) + 2y = 19 \\ 15 + 2y = 19 \\ \hline -15 \quad -15 \\ \hline 2y = 4 \\ \hline \frac{2y}{2} = \frac{4}{2} \\ \hline \boxed{y = 2} \end{array}$	
Solution: $(3, 2)$		