

Solving Systems by Elimination

ei #1:

$$\begin{array}{r} x = 7 + y \\ 2x + y = -10 \end{array} \rightarrow \begin{array}{r} x - y = 7 \\ + (2x + y = -10) \\ \hline 3x = -3 \\ \hline x = -1 \end{array}$$

$$\begin{array}{r} (x - y = 7) \times 2 \\ 2x + y = -10 \end{array} \rightarrow \begin{array}{r} 2x - 2y = 14 \\ - (2x + y = -10) \\ \hline -3y = 24 \\ \hline y = -8 \end{array}$$

solution: $(-1, -8)$

7 + y	x
7 + (-8)	(-1)
-1	-1
2x + y	-10
2(-1) + (-8)	
-2 - 8	
-10	-10

ei #2:

$$\begin{array}{r} 3x + y = 7 \\ y = x + 3 \end{array} \rightarrow \begin{array}{r} y = -3x + 7 \\ (y = x + 3) \times 3 \\ \hline 3y = 3x + 9 \\ \hline 4y = 16 \\ \hline y = 4 \end{array}$$

*brackets!!

STEPS:

- rearrange 1 or both eqns so that like terms are stacked vertically (and "=")
- multiply 1 or both eqns to make one variable have the same or opposite coefficient in each equation
- eliminate 1 variable
ADD \rightarrow coefficients are opposite
SUBTRACT \rightarrow coefficients are same
- solve for remaining variable
- repeat 2-4 for the other variable
- state solution as a coordinate point
- verify

verify:

$$\begin{array}{r} 0 = -4x + 4 \\ 4x = 4 \\ \hline x = 1 \end{array}$$

3x + y	7
3(1) + (4)	
3 + 4	
7	7

y	4
x + 3	4
(1) + 3	
4	4

ei #3:

$$\begin{array}{r} (3x + y = 7) \times 5 \\ (5x + 2y = 13) \times 3 \end{array} \rightarrow \begin{array}{r} 15x + 5y = 35 \\ - (15x + 6y = 39) \\ \hline -y = -4 \\ \hline y = 4 \end{array}$$

$$\begin{array}{r} (3x + y = 7) \times 2 \\ 5x + 2y = 13 \end{array} \rightarrow \begin{array}{r} 6x + 2y = 14 \\ - (5x + 2y = 13) \\ \hline x = 1 \end{array}$$

solution: $(1, 4)$

verify:

3x + y	7
3(1) + 4	
3 + 4	
7	7

5x + 2y	13
5(1) + 2(4)	
5 + 8	
13	13

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