

7.3 Elimination Method

Review: Opposite - have different signs (1 positive / 1 negative)

When we use the elimination method, we look to cancel opposite terms.

Here's what I mean

$$\begin{array}{l} 3x \rightarrow -3x \\ -2y \rightarrow +2y \end{array}$$

We solve systems using elimination vertically.

$$\begin{array}{r} 2x \\ + 2x \\ \hline 4x \end{array} \quad \begin{array}{r} 3y \\ + 4y \\ \hline 7y \end{array} \quad \begin{array}{r} 8x \\ + -8x \\ \hline 0 \end{array}$$

Example #1:
$$\begin{array}{l} 3x + 4y = 7 \\ + \quad 2x - 4y = 13 \\ \hline 5x + 0 = 20 \end{array}$$

★ If we add vertically one-variable should disappear

★ Notice y's cancel out because they are opposites.

Solve for x
$$\begin{array}{r} 5x = 20 \\ 5 \quad 5 \\ \hline x = 4 \end{array}$$

NOT DONE YET

Now substitute x back in to either equation to solve for y.

$$\begin{array}{l} 3x + 4y = 7 \\ 3(4) + 4y = 7 \\ 12 + 4y = 7 \\ 4y = -5 \\ y = -5/4 \end{array}$$

But what if nothing cancels when you add?...

Example #2

$$\begin{cases} 4m + 3n = 13 \\ 2m - 4n = 1 \end{cases}$$

★ Nothing cancels
So what do we
do? We make it so
we can cancel.
Multiply one equation
by something to make
opposite terms.

We can multiply
the bottom equation
by -2 to get the
 m 's to cancel

$$\begin{aligned} 4m + 3n &= 13 \\ -2(2m - 4n) &= -2(1) \end{aligned}$$

$$\begin{aligned} 4m + 3n &= 13 \\ -4m + 8n &= -2 \end{aligned}$$

$$11n = 11$$

$$(n = 1) \leftarrow \text{NOT DONE YET!}$$

SUBSTITUTE

$$2m - 4(1) = 1$$

$$2m - 4 = 1$$

$$2m = 5$$

$$(m = \frac{5}{2})$$

One more example:
Example #3.

$$\begin{cases} 2x + 3y = 1 \\ 5x + 7y = 3 \end{cases}$$

★ At times we need
to multiply both
equations by something
to get a variable to
cancel

Let's get rid of x 's.
What should we multiply
to get opposite terms?

How about...

and

$$-5(2x + 3y) = -5(1)$$

$$2(5x + 7y) = 2(3)$$

Now ~~add~~ Distribute

$$-10x - 15y = -5$$

$$10x + 14y = 6$$

$$-1y = 1$$

$$(y = -1)$$

← NOT DONE YET
Substitute into original
equations

C.W. Pg 335 (14-19 All)

H.W. Worksheet Elimination

$$2x + 3y = 1$$

$$2x + 3(-1) = 1$$

$$2x - 3 = 1$$

$$2x = 4$$

$$(x = 2)$$