Lesson 3 – Solving Systems of Linear Equations by Elimination

This method is called the Elimination Method or Linear Combination.

1. Line up the two linear equations and eliminate one of the variables with the same coefficient by adding or subtracting the two equations.
2. Once one of the variables is removed, solve for the remaining variable.
3. Solve for the variable that was removed by plugging in your solution from part 2 into one of the original equations.
4. Write your answer as an ordered pair (x, y).

Example 1: Solve: $x - y = 2$
$+ \quad 3x + y = -14$

$\frac{4x}{4} = \frac{-12}{4}$

$x = -3$

Solution: $(-3, \underline{-5})$

$x - y = 2$
$(-3) - y = 2$
$+3 \qquad +3$
$\frac{-y}{-1} = \frac{5}{-1}$
$y = -5$

How can you check your answer to see if it is correct?

Plug is soln into each eqn

$-3 - (-5) \stackrel{?}{=} 2$
$-3 + 5$
$2 = 2$

$3(-3) + -5 \stackrel{?}{=} -14$
$-9 - 5$
$-14 = -14$

Example 2: Solve: $5x - 3y = 9$
$-1\,(5x + 4y = 23)$

$5x - 3y = 9$
$+ \quad -5x - 4y = -23$

$\frac{-7y}{-7} = \frac{-14}{-7}$

$y = 2$

Solution (3, 2)

$5x + 4y = 23$
$5x + 4(2) = 23$
$5x + 8 = 23$
$-8 \quad -8$
$\frac{5x}{5} = \frac{15}{5}$ $\boxed{x = 3}$

Example 3: Solve: $(x - 2y = 7)\,2$
$3x + 4y = 1$
$+ \quad 2x - 4y = 14$

(Problem! No coefficients are alike.)
What shall we do?

$\frac{5x}{5} = \frac{15}{5}$

$x = 3$

Solution: $\overset{x,\,y}{(3, -2)}$

$3x + 4y = 1$
$3(3) + 4y = 1$
$9 + 4y = 1$
$-9 \qquad -9$
$\frac{4y}{4} = \frac{-8}{4}$ $y = -2$

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Example 4: Solve: $(2x + 3y = 8)4$
$(5x - 4y = -6)3$

$8x + \cancel{12y} = 32$
$+ \quad 15x - \cancel{12y} = -18$

$\frac{\cancel{23}x}{\cancel{23}} = \frac{14}{23}$

$x = \frac{14}{23}$

$2\left(\frac{14}{23}\right) + 3y = 8$

$23\left[\frac{28}{23} + 3y = 8\right]$

$28 + 69y = 184$
-28

$\frac{69y}{69} = \frac{156}{69}$

$y = \frac{156}{69}$

$y = 2\frac{6}{23}$

Solution $\left(\frac{14}{23}, 2\frac{6}{23}\right)$

Example 5: Solve: $6\left(\frac{x}{2} + \frac{2y}{3} = 4\right)$
$-3\left(x - \frac{y}{3} = 10\right)$

(Oh no, fractions!!)
What shall we do?

$\boxed{3x + 4y = 24}$
$\boxed{-3x + y = -30}$

$5y = \frac{-6}{5} = -1\frac{1}{5}$

$-3x + \frac{-6}{5} = -30$
$+\frac{6}{5} \quad +\frac{6}{5}$

$\boxed{-3x = -30 + \frac{6}{5}}$

$-3x = \frac{-150}{5} + \frac{6}{5}$

$\frac{-3x}{-3} = \frac{-144}{5} \div -3$

$x = \frac{-144}{5} \times \frac{1}{-3}$

$\boxed{x = \frac{48}{5} \text{ or } 3\frac{1}{5}}$

Solution $\left(3\frac{1}{5}, -1\frac{1}{5}\right)$

Example 6: Is (2, -1) a solution for the following systems?

How will you know? check pt in each Eqⁿ

(a) $x + y = 1$ ✓
$3x - y = 4$

$2 - 1 \mid 1$
$1 = 1$

$3(2) - (-1) \mid 4$
$6 + 1$
$7 \neq 4$

(2, -1) is not a solution!

(b) $3x + y = 5$
$6x - 11y = 23$

$3(2) - 1 \mid 5$
$6 - 1$
$5 = 5$

$6(2) - 11(-1) \mid 23$
$12 + 11$
$23 = 23$

(2, -1) is a solution

Assignment: Pg. ; WS 9.2 Quiz on Lessons 1-3 on ____________

$\boxed{\text{pg. } 132}$ → Sec. 9.2 Solving systems w Elimination
#2 – 4
attempt 2 of them!

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