Solving Systems by Elimination

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Steps: ① Rearrange both equations so you create an "x" column, a "y" column and a "constant" column:

$$x + y = \text{constants}$$

② Add OR subtract the entire equations

- Add if the variables to be eliminated have oppositive signs
- Subtract if the variables to be eliminated have the same sign

* You may have to multiply one (or both) equations before adding or subtracting.

* one of the variables will "disappear"

③ Solve for the remaining variable

④ Plug the answer from ③ into one of the original equations and solve for the other variable.

Ex. Find the solution to the system:

$$3x + 4y = -4$$
$$3x + 6y = 6$$

① (don't need to rearrange)

same coefficient → subtract to eliminate the x's

②
$$\begin{array}{r} 3x + 4y = -4 \\ -(3x + 6y = 6) \\ \hline \cancel{0} \quad -2y = -10 \end{array}$$

③ $\frac{-2y}{-2} = \frac{-10}{-2}$

$$\boxed{y = 5}$$

④ $3x + 4(y) = -4$

$3x + 4(5) = -4$

$3x + 20 = -4$

$\quad -20 \qquad -20$

$\frac{3x}{3} = \frac{-24}{3}$

$x = -8$

Solution: $(-8, 5)$

Ex. Solve the system: $4x + 4y = 32$ * Line up columns!

$4y = 6x - 28$ * Eliminate y's

① $-6x \quad -6x$

$-6x + 4y = -28$

② $4x + 4y = 32$

$-(-6x + 4y = -28)$

$10x \quad \emptyset = 60$

③ $\frac{10x}{10} = \frac{60}{10}$

$\boxed{x = 6}$

④ $4y = 6x - 28$

$4y = 6(6) - 28$

$4y = 36 - 28$

$\frac{4y}{4} = \frac{8}{4}$

$\boxed{y = 2}$

Solution:

$(6, 2)$

Ex. Solve the system: $(2x + y = -5) \cdot 5$ ⊛ mult. $10x + 5y = -25$

$-5y - 3x = -3$

$-3x - 5y = -3$ ①

* No coefficients same (multiply eqn #1 by 5 to create 5y)

Add (b/c signs are opposite)

② $10x + 5y = -25$

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

$7x \quad \emptyset = -28$

③ $\frac{7x}{7} = \frac{-28}{7}$

$\boxed{x = -4}$

④ $2x + y = -5$

$2(-4) + y = -5$

$-8 + y = -5$

$+8 \quad +8$

$\boxed{y = 3}$

Solution:

$(-4, 3)$

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