

SOLVE LINEAR SYSTEMS USING ELIMINATION METHOD

If you have a linear system, you can solve it by adding or subtracting the equations in order to eliminate a variable.

- Steps:**
- 1) Add or subtract the 2 equations so that you eliminate either of the variables “x” or “y”. **the one with the same coefficients!*
 - 2) Find the solution for one variable.
 - 3) Substitute the solution into either of the original equations and solve for the other variable.
 - 4) Write a concluding statement: $\therefore$ the solution is (x, y) .

Examples:

1. Solve:
- ① $x + 5y = 2$
 - ② $x + 3y = -4$

Add or subtract the equations to eliminate one of the variables and then solve:	Solve for the other variable:	Solution:
STACK THE EQUATIONS $\begin{array}{r} x + 5y = 2 \\ - \quad x + 3y = -4 \\ \hline \end{array}$ $\times [5y - 3y] = [2 - (-4)]$ $\frac{2y}{2} = \frac{6}{2}$ $\boxed{y = 3}$	SUBSTITUTE <u>y=3</u> $\begin{aligned} x + 5y &= 2 \\ x + 5(3) &= 2 \\ x + 15 &= 2 \\ x &= 2 - 15 \\ \boxed{x = -13} \end{aligned}$	$\therefore$ The POI is $(-13, 3)$ x y

2. Solve: $3x - y = -9$
 $4x + y = 23$

Add or subtract the equations to eliminate one of the variables and then solve:	Solve for the other variable:	Solution:
$\begin{array}{r} 3x - y = -9 \\ + 4x + y = 23 \\ \hline [3x + 4x] \quad \cancel{-y} = [-9 + 23] \\ 7x = 14 \\ \frac{7x}{7} = \frac{14}{7} \\ \boxed{x = 2} \end{array}$	Sub $x=2$ in $\begin{aligned} 4x + y &= 23 \\ 4(2) + y &= 23 \\ 8 + y &= 23 \\ y &= 23 - 8 \\ \boxed{y = 15} \end{aligned}$	$\therefore$ POI 15 $(2, 15)$

Linear Systems: ELIMINATION – Addition or Subtraction?

1. To solve the following linear systems of equations by **elimination**, identify if you would use **addition** or **subtraction** method AND **which variable** you would eliminate first.

Note: you do not have to find the solution to the system.

a) $\boxed{3x} + 8y = -1$
 $\boxed{-3x} + y = -17$

To eliminate the variable x first,
I would use Addition

b) $3x - \boxed{y} = -13$
 $2x - \boxed{y} = -9$

To eliminate the variable y
first,
I would use Subtraction

2. How do you know WHEN to use the addition or subtraction method?

ADD if ...

Signs are DIFFERENT

SUBTRACT if ...

signs are the SAME

Examples:

1. Solve: $4x + 5y = 22$
 $4x + 2y = 16$

Add or subtract the equations to eliminate one of the variables and then solve:	Solve for the other variable:	Solution:
$\begin{array}{r} 4x + 5y = 22 \\ - 4x + 2y = 16 \\ \hline \end{array}$ $[5y - 2y] = [22 - 16]$ $3y = 6$ $\frac{3y}{3} = \frac{6}{3}$ $\boxed{y = 2}$	Sub $y = 2$ in $4x + 5y = 22$ $4x + 5(2) = 22$ $4x + 10 = 22$ $4x = 22 - 10$ $4x = 12$ $\frac{4x}{4} = \frac{12}{4}$ $\boxed{x = 3}$	$\therefore$ POI is $(3, 2)$

2. Solve: $3x - 5y = -20$
 $4x + 5y = -15$

Add or subtract the equations to eliminate one of the variables and then solve:	Solve for the other variable:	Solution:
$\begin{array}{r} 3x - 5y = -20 \\ + 4x + 5y = -15 \\ \hline \end{array}$ $[3x + 4x] = [-20 + (-15)]$ $7x = -35$ $\frac{7x}{7} = \frac{-35}{7}$ $\boxed{x = -5}$	Sub $x = -5$ in $4x + 5y = -15$ $4(-5) + 5y = -15$ $-20 + 5y = -15$ $5y = -15 + 20$ $5y = 5$ $\frac{5y}{5} = \frac{5}{5}$ $\boxed{y = 1}$	$\therefore$ POI is $(-5, 1)$