

Substitution

Steps

1. write either x or y explicitly (one equation)
2. substitute the equation in step 1 into the other eqs
3. solve for one of the variables
4. plug in the value in step 3 into the explicitly written eqs
5. write solution S.S. $\{(x, y)\}$

Eg: $\begin{cases} 2x - 3y = -2 & \text{--- ①} \\ 4x + y = 24 & \text{--- ②} \end{cases}$

Let's write 'y' explicitly and use the 2nd equation

$$\begin{array}{r} 4x + y = 24 \\ -4x \quad -4x \\ \hline y = -4x + 24 \end{array}$$

Now substitute the 'y' in the 1st equation by $-4x + 24$

$$\begin{array}{l} 2x - 3y = -2 \\ 2x - 3(-4x + 24) = -2 \\ 2x + 12x - 72 = -2 \\ 14x - 72 = -2 \\ \quad \quad \quad +72 \quad +72 \\ \hline 14x = 70 \\ \frac{14x}{14} = \frac{70}{14} \end{array}$$

$$\begin{array}{l} \boxed{x = 5} \quad y = -4x + 24 \\ \quad \quad \quad = -4(5) + 24 \\ \quad \quad \quad = -20 + 24 \\ \quad \quad \quad \boxed{y = 4} \end{array}$$

S.S. = $\{(5, 4)\}$

Elimination

Steps

1. Make sure both equations are written in standard form
2. Decide which variable to eliminate (choose the one with ~~different~~ easier coefficients)
3. Make sure the coefficients are the same
4. Add/subtract the two equations together
5. solve for the remaining variable
6. plug the value in step 5 to find the other variable

eg: $\begin{cases} 2x - 3y = -2 \\ 4x + y = 24 \end{cases}$

1. Both equations are written standard form.
2. Let's eliminate 'y'. multiply the second equation by 3.

$$\begin{array}{r} \begin{cases} 2x - 3y = -2 \\ 3 * (4x + y = 24) \end{cases} \rightarrow \begin{cases} 2x - 3y = -2 \\ 12x + 3y = 72 \end{cases} \\ \hline \end{array}$$

$$\begin{array}{r} -14x = 70 \\ \frac{-14x}{-14} = \frac{70}{-14} \\ \boxed{x = 5} \end{array}$$

$$\begin{array}{l} 2x - 3y = -2 \\ 2(5) - 3y = -2 \\ 10 - 3y = -2 \\ -10 \quad -10 \end{array}$$

$$\frac{-3y}{-3} = \frac{-12}{-3}$$

$$\boxed{y = 4}$$

S.S. = $\{(5, 4)\}$