

Solving Systems by Substitution.

There is a way to solve systems without graphing. One of the ways is called the substitution method!

Example

Solve Using the Substitution method:

1 Pick an equ. that has at least 1 variable w/ a coefficient of 1 or -1.

$$\begin{aligned} x-y=6 &\rightarrow x-y=6 \\ x+y=-2 &\end{aligned}$$

$$\begin{aligned} &+y \quad +y \\ x &= 6+y \end{aligned}$$

2 get that variable by itself.

$$\begin{aligned} 6+y+y &= -2 \\ 6+2y &= -2 \\ -6 & \quad -6 \\ 2y &= -8 \\ \frac{2y}{2} &= \frac{-8}{2} \\ y &= -4 \end{aligned}$$

$$\begin{aligned} x-(-4) &= 6 \\ x+4 &= 6 \\ -4 & \quad -4 \\ x &= 2 \end{aligned}$$

3 Substitute what you get into the unused equation

$$(2, -4)$$

4 Solve for the variable.

5 Take what you get and plug it back into an original equ. solve for second variable.

3

$$\begin{aligned} x+y &= 10 \\ y &= x+8 \end{aligned}$$

This one already has a variable by itself!

$$\begin{aligned} x+(x+8) &= 10 \\ x+x+8 & \\ 2x+8 &= 10 \\ -8 & \quad -8 \\ 2x &= 2 \\ \frac{2x}{2} &= \frac{2}{2} \\ x &= 1 \end{aligned}$$

$$\begin{aligned} 1+y &= 10 \\ -1 & \quad -1 \\ y &= 9 \end{aligned}$$

$$(1, 9)$$

2

$$\begin{aligned} x-y &= -3 \\ 2x+3y &= -6 \end{aligned}$$

$$\begin{aligned} &+y \quad +y \\ x &= y-3 \end{aligned}$$

$$\begin{aligned} 2(y-3)+3y &= -6 \\ 2y-6+3y &= -6 \\ 5y-6 &= -6 \\ +6 & \quad +6 \\ 5y &= 0 \\ \frac{5y}{5} &= \frac{0}{5} \\ y &= 0 \end{aligned}$$

$$\begin{aligned} x-0 &= -3 \\ x &= -3 \end{aligned}$$

$$(-3, 0)$$

4

$$\begin{aligned} r-2s &= 0 \\ 4r-3s &= 15 \end{aligned}$$

$$\begin{aligned} &+2s \quad +2s \\ r &= 2s \end{aligned}$$

$$\begin{aligned} 4(2s)-3s &= 15 \\ 8s-3s &= 15 \\ 5s &= 15 \\ \frac{5s}{5} &= \frac{15}{5} \\ s &= 3 \end{aligned}$$

$$\begin{aligned} r-2(3) &= 0 \\ r-6 &= 0 \\ +6 & \quad +6 \\ r &= 6 \end{aligned}$$

$$r=6$$