

System of Equations

Substitution

Point of Intersection

Substitution Method

Steps:

- i) Choose one equation and isolate one variable; this equation will be considered the first equation. (easiest one to get $x=$ or $y=$ from either eqn 1 or eqn 2)
- ii) Substitute the solution from step 1 into the second equation and solve for the variable in the equation.
- iii) Using the value found in step 2, substitute it into the first equation and solve for the second variable.
- iv) Substitute the values for both variables into both equations to show they are correct.

Substitution

$$\begin{array}{l} \text{① } y = 2x + 2 \\ \text{② } y = 6x + 14 \\ \hline \end{array}$$

$y = 6x + 14$

$2x + 2 = 6x + 14$

$2x - 6x = 14 - 2$

$-4x = 12$

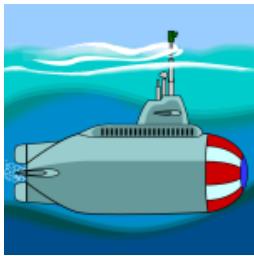
$\underline{x = -3}$

Sub in ① $y = 2(-3) + 2$

$y = -6 + 2$

$\underline{y = -4}$

$(-3, -4)$



$$\begin{array}{l} y = 3 + 3x \quad \textcircled{1} \\ + 3x - 8y = -3 \quad \textcircled{2} \\ \hline 3x - 8y = -3 \\ 3x - 8(3 + 3x) = -3 \\ 3x - 24 - 24x = -3 + 24 \\ -21x = 21 \\ x = -1 \\ \text{Sub in } \textcircled{1} \quad y = 3 + 3(-1) \\ y = 3 - 3 \\ y = 0 \end{array}$$

Point of Intersection $(-1, 0)$

What if??

$$\begin{array}{rcl} \cancel{8x - 2y = -2} & & \textcircled{1} \\ -4x + 3y = 11 & \textcircled{2} \\ \hline \end{array}$$

rearrange $\textcircled{1}$ $8x - 2y = -2 - 8x$
 $\underline{-2y} = \underline{-2 - 8x}$
 $y = 1 + 4x$ $\textcircled{1}$

$$\begin{array}{rcl} -4x + 3y & = & 11 \\ -4x + 3(1 + 4x) & = & 11 \\ -4x + 3 + 12x & = & 11 \\ 8x + 3 & = & 11 - 3 \\ 8x & = & 8 \\ x & = & 1 \end{array}$$

Sub in $\textcircled{1}$

$$\begin{array}{rcl} y & = & 1 + 4 \\ y & = & 1 + 4 \\ y & = & 5 \\ \hline (1, 5) \end{array}$$

Solve the system by Substitution Method

$$\begin{array}{l} \textcircled{1} \quad x + 2y = 3 \quad \text{solve for } x \rightarrow x = 3 - 2y \\ \textcircled{2} \quad \underline{3x + 5y = 8} \\ \qquad \qquad \qquad 3x + 5y = 8 \\ \qquad \qquad \qquad 3(3-2y) + 5y = 8 \\ \qquad \qquad \qquad 9 - 6y + 5y = 8 \\ \qquad \qquad \qquad -6y + 5y = 8 - 9 \\ \qquad \qquad \qquad -y = -1 \\ \qquad \qquad \qquad y = 1 \end{array}$$



Sub in ①

$$\begin{aligned} x + 2y &= 3 \\ x + 2(1) &= 3 \\ x + 2 &= 3 \\ x &= 3 - 2 \\ x &= 1 \end{aligned}$$

(1,1)

