

# 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

$$y = 2x + 2 \quad (1)$$

$$y = 6x + 14 \quad (2)$$

$$y = 6x + 14$$

$$2x + 2 = 6x + 14$$

$$2x - 6x = 14 - 2$$

$$-4x = 12$$

$$x = -3$$

$$\text{Sub in } (1) \quad y = 2(-3) + 2$$

$$y = -6 + 2$$

$$y = -4$$

$$(-3, -4)$$



$$\begin{array}{l} y = 3 + 3x \quad \textcircled{1} \\ +3x - 8y = -3 \quad \textcircled{2} \end{array}$$

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$$\begin{array}{l} 3x - 8y = -3 \\ 3x - 8(3 + 3x) = -3 \\ \underline{3x} \quad \underline{-24} \quad \underline{-24x} = -3 \quad +24 \\ \underline{-21x} \quad \underline{-21} \end{array}$$

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$$\begin{array}{l} \text{Sub in } \textcircled{1} \\ y = 3 + 3(-1) \\ y = 3 - 3 \\ y = 0 \end{array}$$

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Point of Intersection  $(-1, 0)$

What if??

$$\underline{8x - 2y = -2} \quad (1)$$

$$-4x + 3y = 11 \quad (2)$$

rearrange (1)

$$\begin{aligned} 8x - 2y &= -2 - 8x \\ -2y &= -2 - 8x \\ y &= 1 + 4x \quad (1) \end{aligned}$$

$$-4x + 3y = 11$$

$$-4x + 3(1 + 4x) = 11$$

$$-4x + 3 + 12x = 11$$

$$8x + 3 = 11 - 3$$

$$8x = 8$$

$$x = 1$$

Sub in (1)

$$y = 1 + 4(1)$$

$$y = 1 + 4$$

$$y = 5$$

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$$(1, 5)$$

Solve the system by Substitution Method

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



Sub in ①

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

(1,1)

