09. April. 2023

<System of linear Equations>

: Typically means more than one equation

A system of linear equations can have :

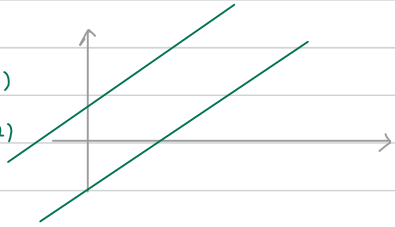
- No solutions
- Unique solution (means one & only one solution)
- Infinite number of solutions

Can not have 2 and only 2 solutions.

* No Solution

$-2x + y = 2$ (a.1)

$-4x + 2y = -2$ (a.2)



(a.1) $\Rightarrow y = 2x + 2$

Substitute in to (a.2)

$-4x + 2(2x+2) = -2$

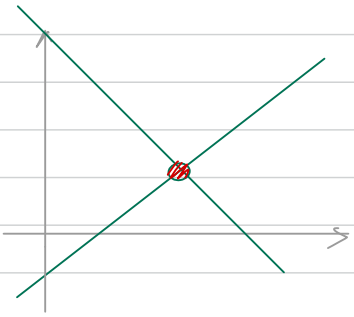
$-4x + 4x + 4 = -2$

$4 = -2$ (x) Contradiction

* Unique Solution

$3x - 3y = 3$ (b.1)

$x + y = 7$ (b.2)



(b.1) $\Rightarrow 3x = 3y + 3$

$x = y + 1$

Substitute in to (b.2)

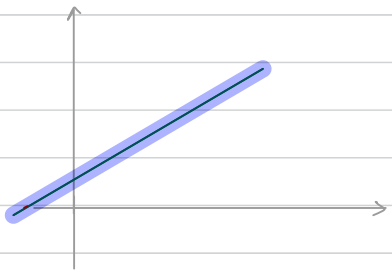
$(y+1) + y = 7$

$2y = 7 - 1 = 6 \Rightarrow \boxed{y = 3}$ (o) $x = 4$ Answer $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 4 \end{bmatrix}$

* Infinity of Solutions

$x - 2y = -2$ (c.1)

$3x - 6y = -6$ (c.2)



$x + 2 = 2y$

$\{ y = \frac{1}{2}x + 1 \ , \ x \in R \}$

$\Rightarrow$ all the solutions