

SYSTEMS OF LINEAR EQUATIONS (PART I)

$$2x + 3y = 4$$

$$\frac{2}{x} + 3y = 4 \quad \text{Not linear} \quad \frac{2}{x} = 2x^{-1}$$

$$\sqrt{x} + 3y = 5 \quad \text{Not linear} \quad \sqrt{x} = x^{1/2}$$

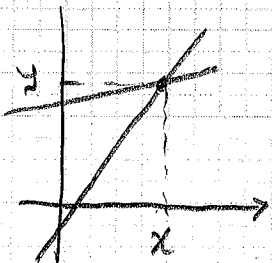
$$\sqrt{2}x + 3y = 3$$

$$-2x + 5y = 7$$

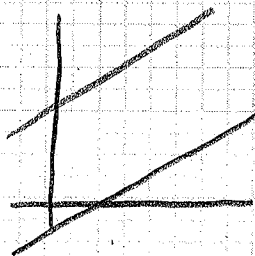
$$\frac{3}{4}x + \frac{2}{5}y = 7$$

2 EQ & 2 VAR

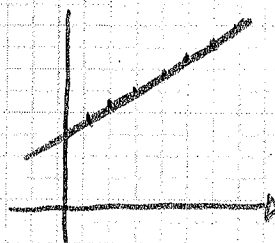
$$\text{EX: } \begin{cases} 2x + 3y = 5 \\ 4x - 2y = 2 \end{cases} \Rightarrow 2x = 5 - 3y \Rightarrow x = \frac{5 - 3y}{2}$$



consistent
(unique solution)



inconsistent
(no solution)



dependent
(infinite solutions)

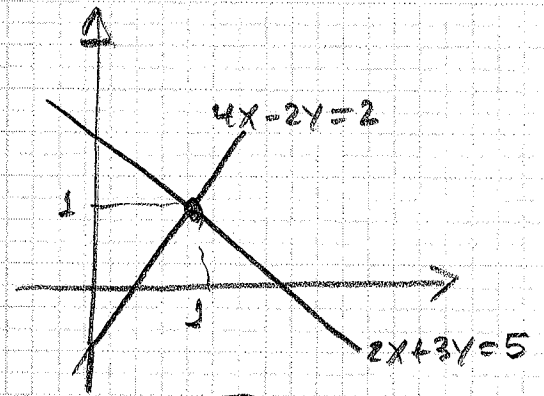
Method of Substitution

$$4 \left(\frac{5 - 3y}{2} \right) - 2y = 2 \Rightarrow 10 - 6y - 2y = 2 \Rightarrow$$

$$\Rightarrow 10 - 8y = 2 \Rightarrow 10 = 2 + 8y \Rightarrow 8 = 8y \Rightarrow y = 1$$

$$x = \frac{5 - 3 \cdot 1}{2} = \frac{5 - 3}{2} = \frac{2}{2} = 1 \quad \text{solution: } (1, 1)$$

$x=1 \rightarrow 2x+3y = 2 \cdot 1 + 3 \cdot 1 = 5$
 $y=1 \rightarrow 4x-2y = 4 \cdot 1 - 2 \cdot 1 = 2$



EX: $\begin{cases} 2x+3y=5 \\ 4x+6y=7 \end{cases} \Rightarrow 3y = 5-2x \Rightarrow y = \frac{5-2x}{3}$

$4x + 6 \left(\frac{5-2x}{3} \right) = 4x + 10 - 4x = 7 \Rightarrow 10 = 7$
 ABSURD

Inconsistent
No solution



EX: $\begin{cases} 2x+3y=5 \\ 4x+6y=10 \end{cases} \Rightarrow y = \frac{5-2x}{3}$

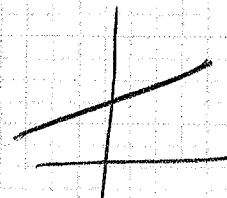
$2x = 5 - 3y$
 $x = \frac{5-3y}{2}$

$4x + 6 \left(\frac{5-2x}{3} \right) = 4x + 10 - 4x = 10 \Rightarrow 10 = 10$
 TRUE

solution:

$(x, \frac{5-2x}{3})$

- when $x=1$ $\frac{5-2 \cdot 1}{3} = 1$ $(1, 1)$
 " $x=2$ $\frac{5-2 \cdot 2}{3} = \frac{1}{3}$ $(2, \frac{1}{3})$



solution
 $(\frac{5-3y}{2}, y)$