

4.1. Systems of Linear Equations in 2 variables

Wednesday, September 20, 2017

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Goals: ① Solve systems of linear Equations by the method of substitution.

② Solve systems of linear Equations by the method of elimination

③ Solve systems of linear Equations by using the TI calculators

④ Solve application problems.

E.g. of a linear Equation:

$$y = 2x + 1$$

$$3x - 5y = 10$$

Method of Substitution

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$$\begin{cases} 3x + 5y = -9 \\ x + 4y = -10 \end{cases} \quad \text{Solve this system}$$

Key: Pick an equation. Solve for one variable in terms of the other. Substitute the expression you got for that variable into the remaining equation. This turns that equation into an equation in one variable. Done!

$$\text{Pick } x + 4y = -10$$

$$x = -4y - 10$$

Substitute this into the first equation:

$$3(-4y - 10) + 5y = -9$$

$$-12y - 30 + 5y = -9$$

$$\begin{array}{r|l} -7y - 30 = -9 & \boxed{y = -3} \\ -7y = 21 & \end{array}$$

$$x = -4 \cdot (-3) - 10 = 2$$

Solution: $(2, -3)$.

Method of Elimination

$$\begin{cases} 3x + 5y = -9 \\ x + 4y = -10 \end{cases}$$

Key: Multiply either one or both equations by some number in a way that after we add them, we can eliminate a variable.

$$\begin{cases} 3x + 5y = -9 \\ -3(x + 4y) = -3(-10) \end{cases} \rightarrow \begin{array}{r|l} 3x + 5y = -9 & \text{Add} \\ -3x - 12y = 30 & \text{Side} \\ \hline -7y = 21 & \text{by} \\ & \text{Side} \end{array}$$

$$y = -3$$

$$x + 4(-3) = -10$$

$$x - 12 = -10 \rightarrow x = 2$$

} Solution
(2, -3)

Eliminate y

$$4(3x + 5y) = (-9) \cdot 4$$

$$-5(x + 4y) = -10 \cdot (-5)$$

$$\rightarrow \begin{cases} 12x + 20y = -36 \\ -5x - 20y = 50 \end{cases} \quad \text{Add}$$

$$7x = 14$$

$$x = 2.$$

$$2 + 4y = -10$$

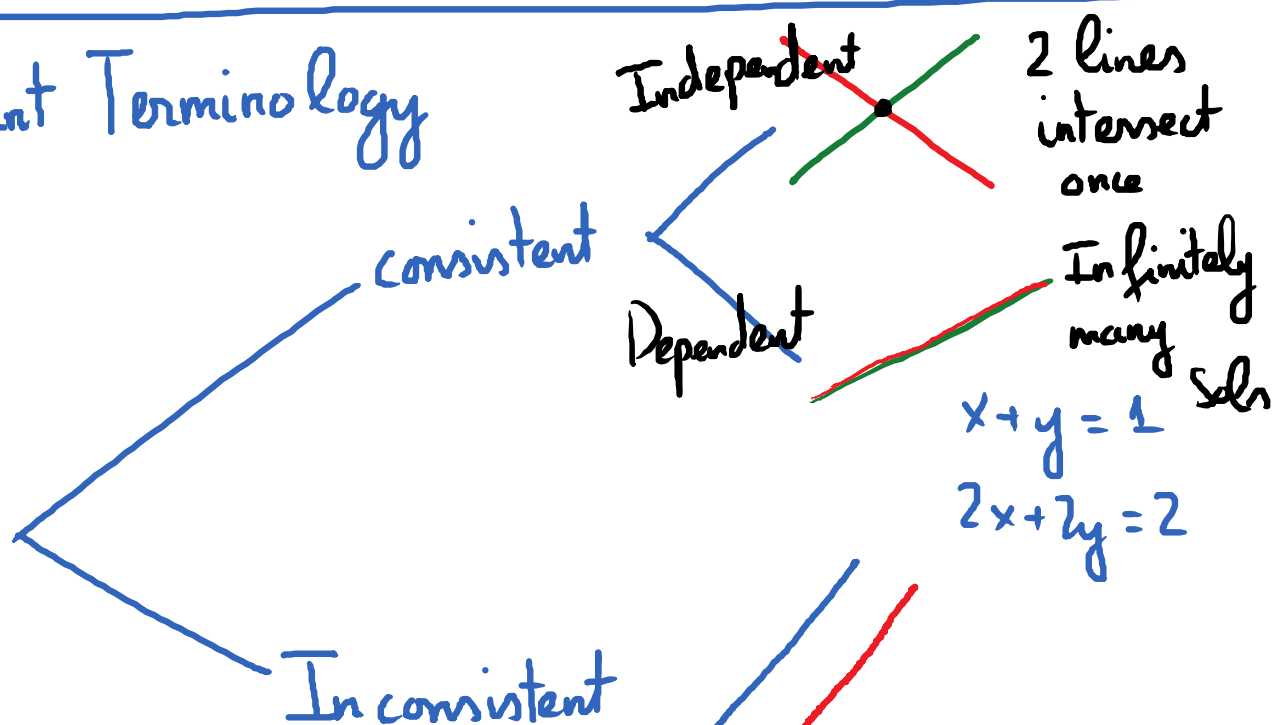
$$4y = -12; y = -3.$$

Solve by using TI calculator

$$\begin{cases} x - y = -3 \\ -2x - y = 3 \end{cases} \rightarrow \begin{cases} x = y - 3 ; y = x + 3 \\ -2x = y + 3 ; y = -2x - 3 \end{cases}$$

$$\begin{cases} y = x + 3 \\ y = -2x - 3 \end{cases}$$

Important Terminology



(2 equations correspond to 2 parallel lines E.g. $\begin{cases} x + y = 1 \\ 2x + 2y = 5 \end{cases}$)