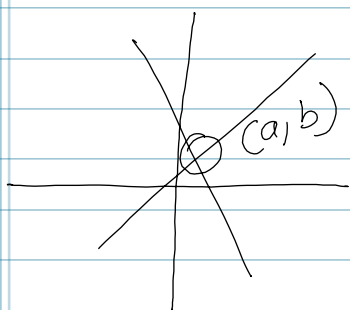


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Section 4.1

System of Linear Equations

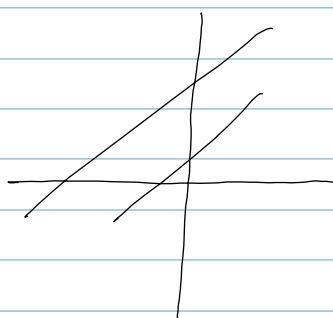
Types of solutions



Unique soln. (a, b)

Consistent

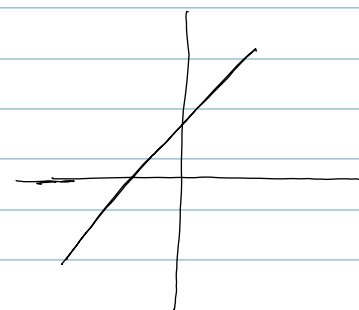
Independent



no soln.

Inconsistent

Independent



- Infinite Solns.
all points on the
line

- Consistent

- Dependent

Methods

① Graphing

② Substitution

③ Elimination (addition)

④ Cramer's rule

$$\text{lcd } 6 \quad -\frac{x}{6} + \frac{y}{2} = \frac{1}{2}$$

$$\text{lcd } 12 \quad \frac{x}{3} - \frac{y}{6} = -\frac{3}{4}$$

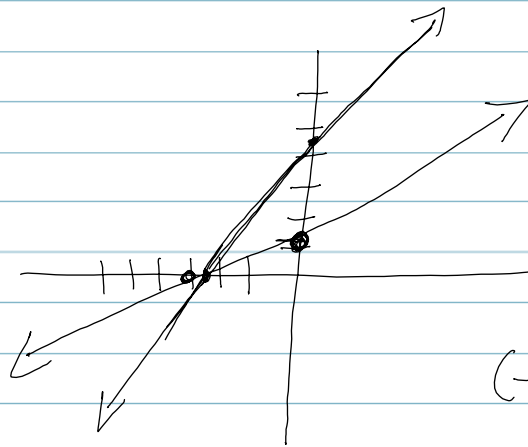
$$\textcircled{1} \quad -x + 3y = 3$$

$$\textcircled{2} \quad 4x - 2y = -9$$

Graphing

$$-x + 3y = 3$$

x	y
0	1
-3	0



$(-2, \frac{1}{2})$ guess

$$4x - 2y = -9$$

x	y
0	$\frac{9}{2} = 4.5$
$-2.25 = -\frac{9}{4}$	0

Substitution

- ① solve for any variable
(1 coefficient is good)
- ② Substitute into the other equation
- ③ solve for first variable
- ④ solve for second variable

$$\textcircled{1} \quad -x + 3y = 3 \quad \left(-\frac{21}{10}, \frac{3}{10}\right)$$

$$\textcircled{2} \quad 4x - 2y = -9$$

$$-x + 3y = 3$$

$$-x = 3 - 3y$$

$$x = -3 + 3y$$

$$x = 3y - 3$$

$$4\textcircled{x} - 2y = -9$$

$$4(3y - 3) - 2y = -9$$

$$12y - 12 - 2y = -9$$

$$10y = -9 + 12$$

$$10y = 3$$

$$y = \frac{3}{10}$$

$$x = 3y - 3$$

$$x = 3\left(\frac{3}{10}\right) - 3$$

$$x = \frac{9}{10} - 3 = \frac{9}{10} - \frac{30}{10} = \frac{-21}{10}$$

$$x = \frac{-21}{10}$$

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Elimination

(use
LCM)

$$\textcircled{1} -x + 3y = 3$$

$$\textcircled{2} 4x - 2y = -9$$

$$\left(\begin{array}{c|c} -21 & 3 \\ \hline 10 & 10 \end{array} \right)$$

$$\textcircled{1} -x + 3y = 3$$

$$\textcircled{2} 4x - 2y = -9$$

$$4 \textcircled{1} \quad \cancel{-4x} + 12y = 12$$

$$\textcircled{2} \quad \cancel{4x} - 2y = -9$$

$$10y = 3$$

$$y = \frac{3}{10}$$

$$-x + 3y = 3$$

$$-x + 3\left(\frac{3}{10}\right) = 3$$

$$x = \frac{-21}{10}$$

$$\begin{array}{r} \cancel{x+y=7} \\ \cancel{-x-y=7} \\ \hline 0=0 \end{array}$$

true \Rightarrow Same line
 \Rightarrow Infinite Solns.

$$\begin{array}{r} x+y=7 \\ -x-y=12 \\ \hline 0=19 \end{array}$$

false \Rightarrow parallel lines
 \Rightarrow no solns.