Note Title 9/9/2009

2.3 / Systems of Linear Equations

Ex] $\left.\begin{array}{l} 5x+3y=-9 \\ -x-y=1 \end{array}\right\}$ "Solve a System"

→ Finding an ordered pair (x,y) that satisfies <u>both</u> equations

→ 3 Methods of solving a system

- * Graphing
- * Substitution
- * Elimination

Method 1: Substitution

$$5x + 3y = -9$$
$$-x - y = 1$$

* Choose an equation that is easy to work with, and solve for one of the variables.

→ Solve for x in the 2nd equation

$$\begin{aligned} -x - y &= 1 \\ +x \quad\;\; &\;\;\; +x \\ \hline -y &= 1 + x \\ -1 \;\; &\;\;\; -1 \\ \hline x &= -1 - y \end{aligned}$$

Substitute x into 1st equation

$$5(-1-y) + 3y = -9$$
$$-5 - 5y + 3y = -9$$

Solution:

$(-3, 2)$

$$-5 - 2y = -9$$
$$-2y = -4$$
$$\underline{y = 2}$$

$$x = -1 - 2 = -3$$

② Elimination

$$5x + 3y = -9$$
$$-x - y = 1$$

* Idea: add equations together, eventually eliminating one of the variables.

* You may need to multiply one or both rows by a nonzero constant to be able to "delete" one of the variables

$$\begin{cases} 5x + 3y = -9 \\ 5(-x - y = 1) \end{cases}$$

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

$$-2y = -4$$

$$y = 2$$

$$\boxed{(-3, 2)}$$

SOLUTION

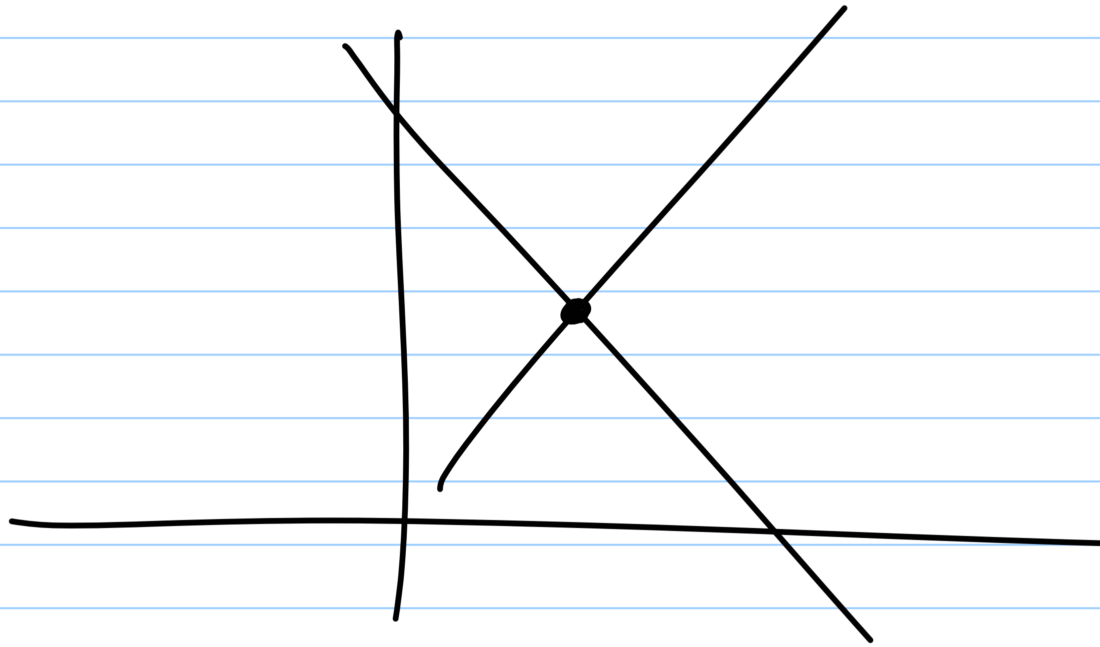
$$5x + 3(2) = -9$$

$$5x + 6 = -9$$

$$5x = -15$$

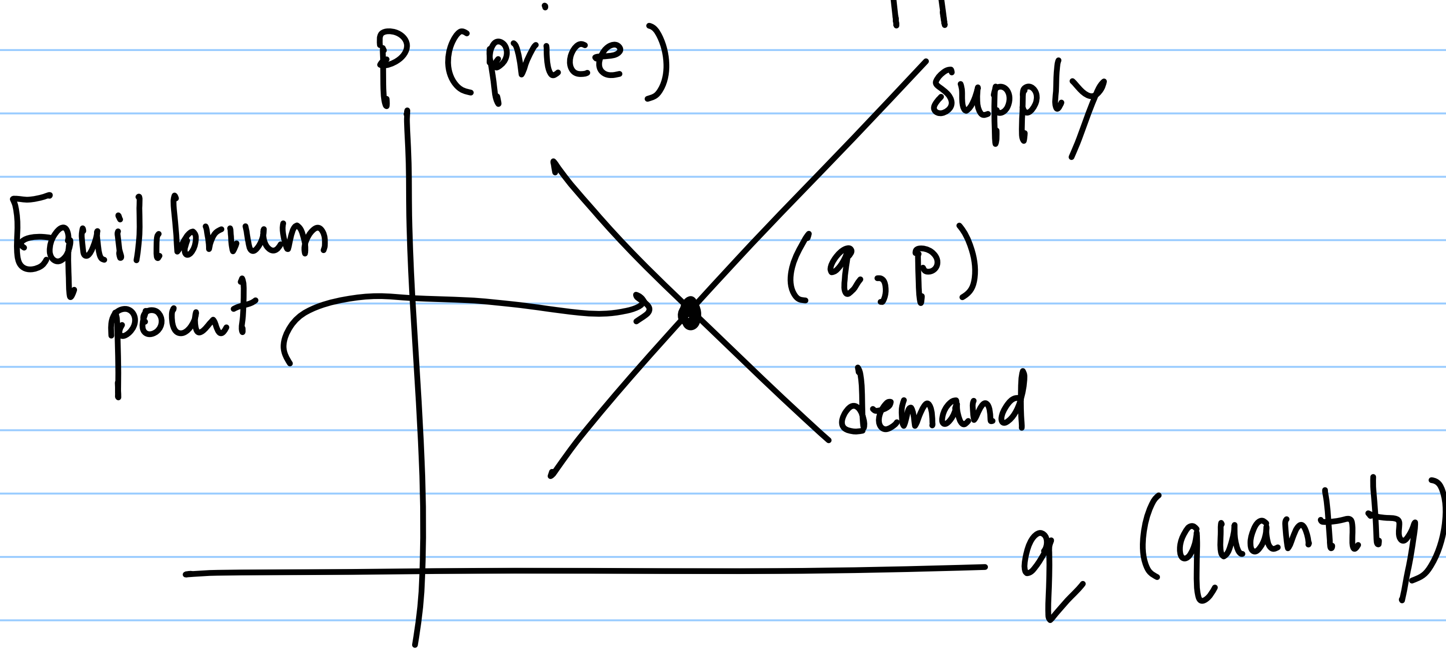
$$x = -3$$

Graphing Method.



When is a system a useful tool?

We'll look at 1 application:



* Finding the "equilibrium point" is synonymors with finding the "solution" to a system.

$$p + 2q = 200$$
$$-1(p - 5q = 60)$$

$$\left\{\begin{array}{l} p + 2q = 200 \\ -p + 5q = -60 \end{array}\right.$$

$$7q = 140$$

$q = 20$ units

$p = \$160$

Pg. 141, # 64

* Create supply equation
* Create demand equation

hint: find 2 ordered pairs, find m & b

* Figure out where supply & demand meet.

2.4 Linear Inequalities

Recall: Profit = Revenue − Cost

One is happy ü when profit is positive.

Let P represent profit

$$P > 0$$

Ex] Suppose revenue is given by
$R(x) = 30x$ (x = # of units)

Suppose that cost is given by $C(x) = 10x + 1500$.

How many units must be sold to achieve (positive) profit?

* What is the profit function?

Profit = Revenue - Cost

$$P(x) = 30x - (10x + 1500)$$

$$P(x) = 20x - 1500$$

* Now, $x = \#$ of units sold.

So we need to solve

$$20x - 1500 > 0$$
$$\quad + 1500 \quad + 1500$$

$$20x > 1500$$

$$x > 75 \text{ units}$$

* When working with linear inequalities, if you multiply/divide both sides of the inequality by a negative #, sign turns around.

Double Inequalities

Solve: $80 \le \dfrac{261+x}{4} \le 90$

(2 problems in one)

$(80) \le \left(\dfrac{261+x}{4}\right)$ **AND** $\left(\dfrac{261+x}{4}\right) \le (90)$

$320 \le 261 + x$

$-261 \quad -261$

$59 \le x$

AND

$261 + x \le 360$

$x \le 99$

$$\boxed{59 \le x \le 99}$$

Last I Clicker Question

E $\quad 36 < .554x - 2.886 < 60$

Note: Between 3 & 5 yrs corresponds to 36 and 60 months.