Section 1.5 - A few more comments

Note Title 6/15/2009

Revenue (how much money that comes in from sale of a product)

Cost (Amount of money spent making product; variable cost fixed cost)

Profit: Revenue - Cost

If Profit > 0; Revenue > Cost

Profit = 0; Revenue = Cost

"Break Even" point.

Work for Checker 1:

$$90.75x = 24.50x + 4770$$
$$-24.50x \quad -24.50x$$

$$\frac{66.25x}{66.25} = \frac{4,770}{66.25}$$

$x = 72$ necklaces.

1.7/ Systems of Linear Equations

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

* We are interested in (x, y) that satisfy Both equations.

"Solve the System"

↳ looking for an ordered pair (x, y) that satisfies both equations.

Methods of Solving Systems

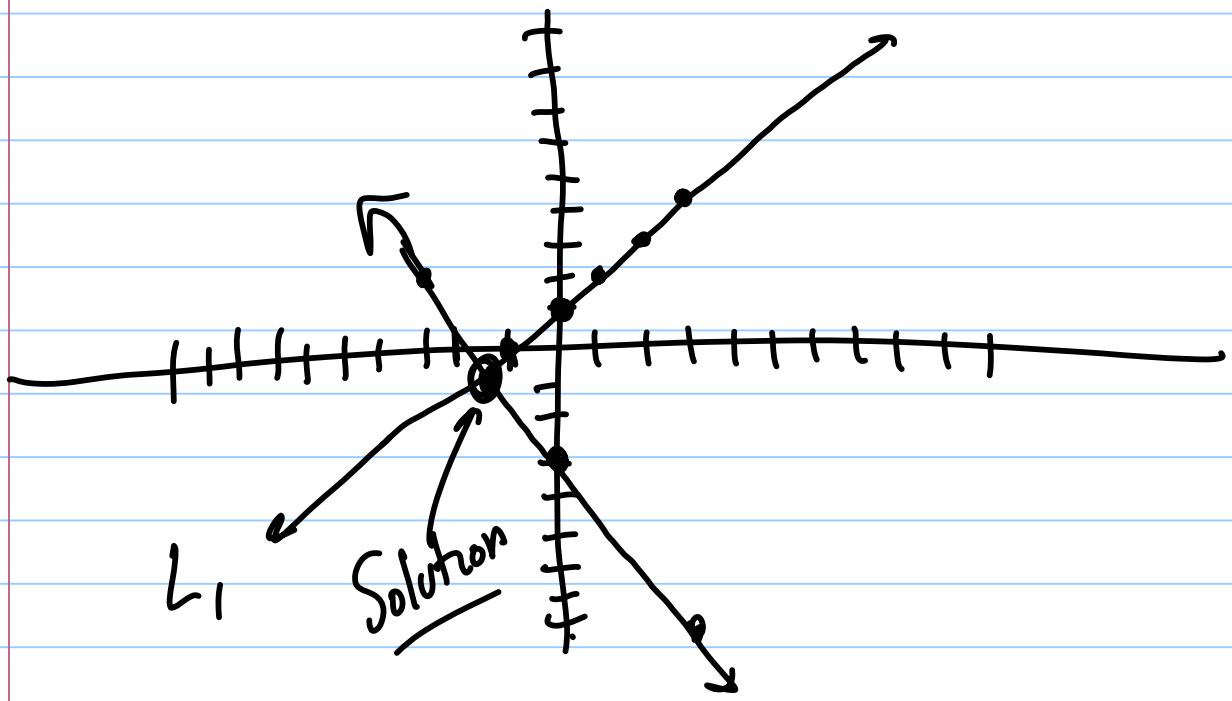
a) Method of Graphing
b) Substitution
c) Elimination

① Method 1: Graphing:

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

$\frac{3y}{3} = \frac{-5x}{3} - \frac{9}{3}$ L_2 $y = \frac{-5}{3}x - 3$

L_1 $y = x+1$



② Substitution:

$$\begin{cases} 5x+3[\quad] = -9 \\ -x+y = 1 \end{cases}$$

Choose an equation that is "simple" to work with; here, solving for y in 2nd equation gives [redacted]

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

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

$$8x + 3 = -9$$

$$8x = -12$$

$$x = \frac{-12}{8} = \frac{-3}{2}$$

$$y = x + 1$$

$$y = \frac{-3}{2} + 1 = -\frac{1}{2}$$

Solution: $\left(-\frac{3}{2}, -\frac{1}{2}\right)$

(3) Elimination:

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

* Multiply one or both rows by a nonzero constant; upon adding the resulting equations together, one should eliminate either x or y

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

$$5(-x + y = 1)$$

$\left(\frac{-3}{2}, \frac{-1}{2}\right)$

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

$$\frac{8y}{8} = \frac{-4}{8}$$

Solve for y

$$y = -\frac{1}{2}$$

$-x + y = 1$

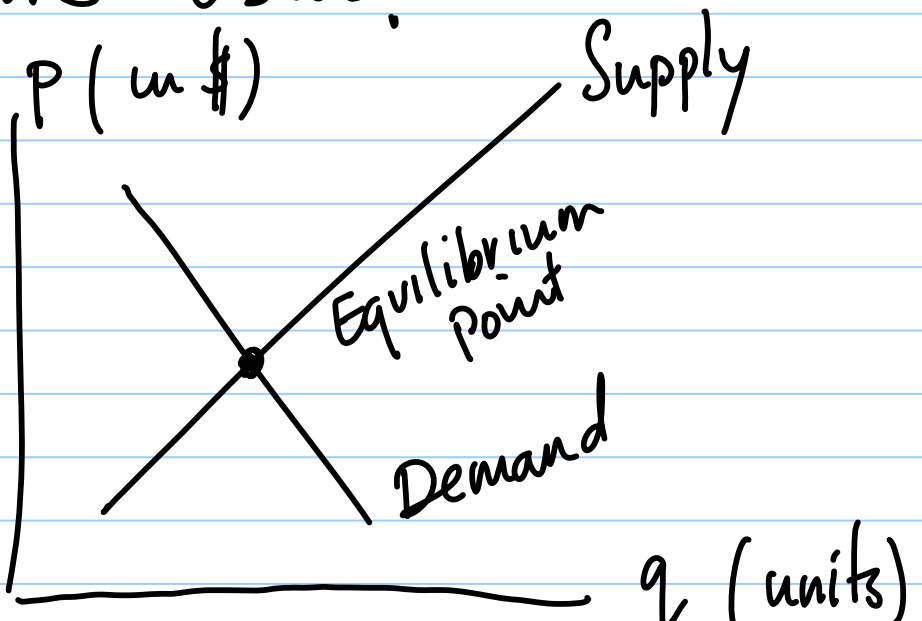
$-x - \frac{1}{2} = 1$

$-x = \frac{3}{2}$ $\quad x = \frac{-3}{2}$

(plug into one of the original equations)

Where are Systems Used?

→ Economics



To find an equilibrium point means you are solving a system.

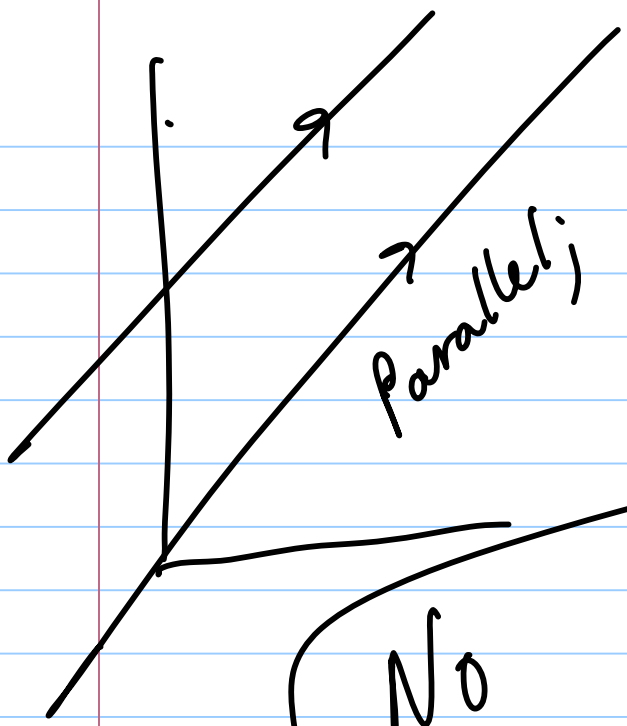
In the case of this example, one looks for (q, p) that satisfies each line.

IC #2:

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

$$p + 2(20) = 200$$
$$p = \$160$$

$$p + 2q = 200$$
$$-p + 5q = -60$$
$$7q = 140$$
$$q = 20 \text{ units}$$



$$\begin{cases} y = 2x + 5 \\ y = 2x \end{cases}$$

NO SOLUTION

$$\begin{cases} y - 2x = 5 \\ y - 2x = 0 \end{cases}$$

Ex) $\begin{cases} 2y - 4x = 10 \\ -2(y - 2x = 0) \end{cases}$ $\quad \begin{cases} 2y - 4x = 10 \\ -2y + 4x = 0 \end{cases}$

$0 = 10$

Doesn't make sense

Ex) $\begin{cases} 2y - 4x = 10 \\ -2(y - 2x = 5) \end{cases}$ Solve the system

$\begin{cases} 2y - 4x = 10 \\ -2y + 4x = -10 \end{cases}$ $\quad 0 = 0$ o.k....

So... the 2 lines in the system coincide ... they have infinitely many solutions.

Section 1.8 / Inequalities

* When dividing/multiplying by a negative sign, inequality symbol switches.

Ex)

$$-5x+3 \leq x+5$$
$$-x \quad -x$$
$$-6x+3 \leq 5$$
$$-3 \quad -3$$
$$-6x \leq 2$$

$$\frac{-6x}{-6} \leq \frac{2}{-6}$$

$$x \geq \frac{-1}{3}$$

Online HW

Ex Double Inequality

"Between" in word problems

$$-4 < 2x+1 < 4$$

→ $-4 < 2x+1$ AND $2x+1 < 4$

$\quad -1 \quad -1$

$\quad 2x < 3$

$\quad x < \frac{3}{2}$

(Both inequalities true at same time)

AND

$-4 < 2x+1$

$\quad -1 \quad -1$

$-5 < 2x$

$\frac{-5}{2} < \frac{2x}{2}$

AND

$\frac{-5}{2} < x$ AND $x < \frac{3}{2}$

$$\boxed{\frac{-5}{2} < x < \frac{3}{2}}$$

on test 1 !!