5.2. Systems of Linear Inequalities in 2 variables

Thursday, October 12, 2017 8:30 AM

Goals: (1) Solve systems of linear inequalities

(2) Applications.

E.g.

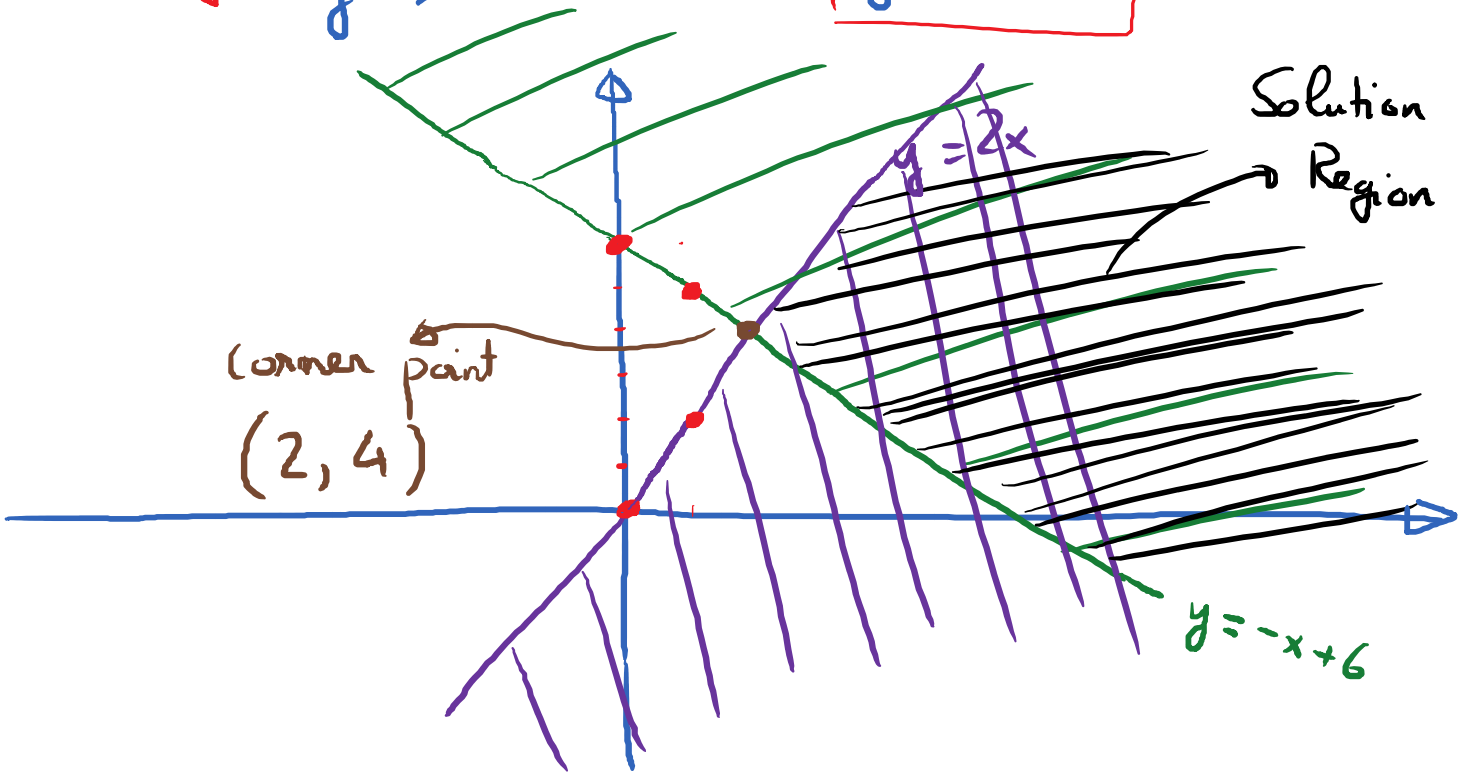
$$\begin{cases} x + y > 6 \\ 2x - y > 0 \end{cases}$$

$$\begin{pmatrix} 1 & 1 \\ 2 & -1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 6 \\ 0 \end{pmatrix}$$

Solve this system by graphing.

$y > -x + 6$

$-y > -2x \rightarrow y < 2x$



The solution region for a system of linear inequalities is called the feasible region of the system.

In this example, the feasible region is unbounded.

A corner point is the intersection of 2 boundary liners of the feasible region.

Application:

A manufacturer produces 2 kinds of product.

A: 8 hours to design, 4 hours to finish

B: 8 hours to design, 12 hours to finish.

Total # of hours to design products is at most 160 hours.

Total # of hours to finish products is at most 180 hours.

The # of product A is no more than 15.

x : # of product A ; y : # of product B.

Q: Write down a system of inequalities that describe the constraints that x and y must satisfy. Find the feasible region and the corner point(s).

Sol:

$$8x + 8y \leq 160$$

$$4x + 12y \leq 180$$

$$\boxed{x \leq 15}$$

$$\boxed{x \geq 0} \qquad \boxed{y \geq 0}$$

$$\begin{pmatrix} 8 & 8 \\ 4 & 12 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 160 \\ 180 \end{pmatrix}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = ?$$

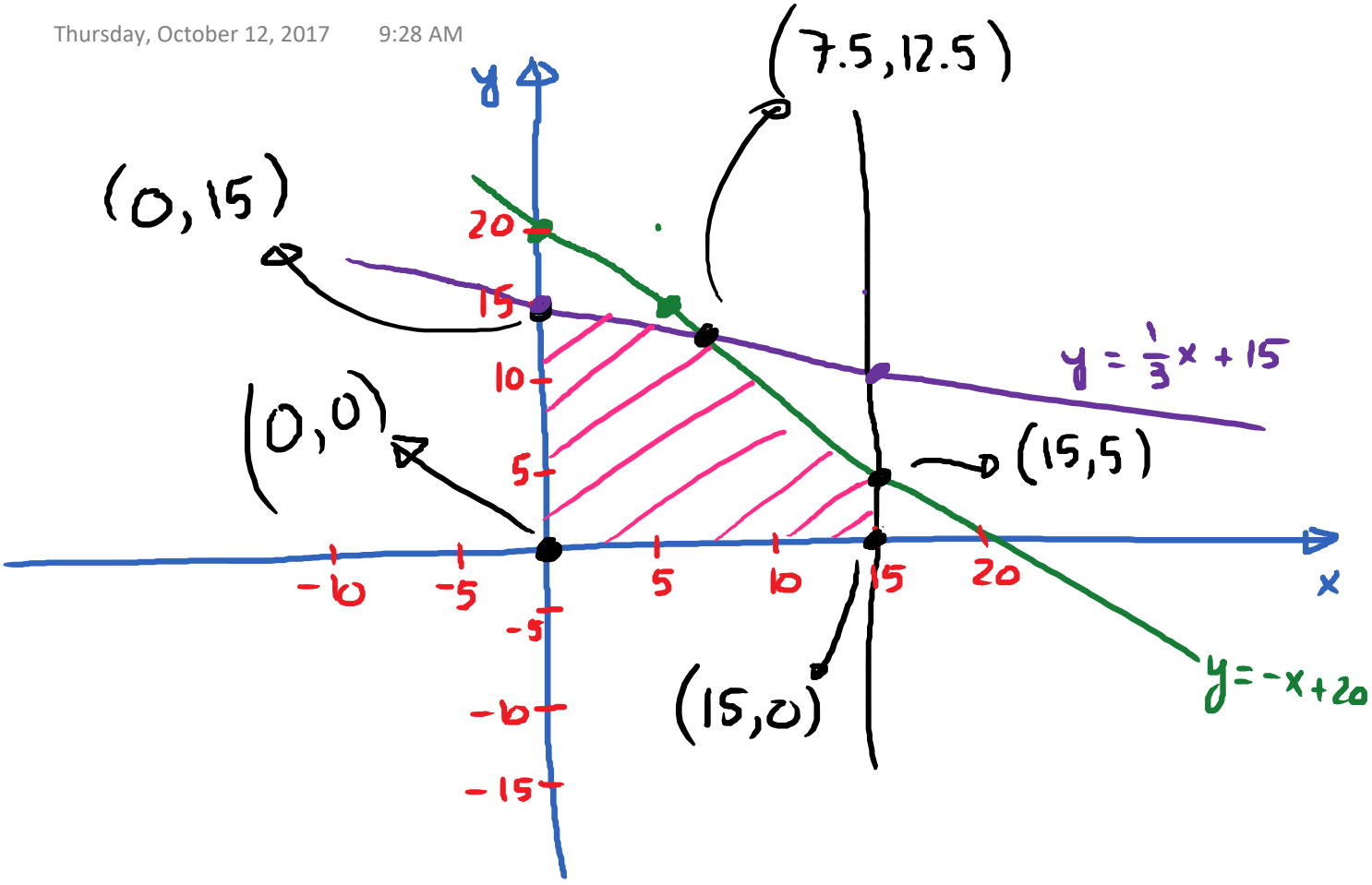
$$8y \leq -8x + 160$$

$$\boxed{y \leq -x + 20}$$

$$12y \leq -4x + 180$$

$$\boxed{y \leq -\tfrac{1}{2}x + 15}$$

$$y \leq -\frac{1}{3}x + 15$$


y
x
(7.5,12.5)
(0,15)
(0,0)
(15,5)
(15,0)
y = 1/3 x + 15
y = -x + 20
20
15
10
5
-5
-10
-15
-10
-5
5
10
15
20

HW #6.