§3.2 Linear Programming Problem

Recall some properties of inequalities

① If $a<b$, then $a \pm c < b \pm c$ for any number c.

② If $a<b$ & $c>0$ (positive) then $ac<bc$

③ If $a<b$ & $c<0$ (negative) then $ac>bc$

ex) $5x - 3y \geq 2$ (draw the graph)

* Inequalities with 2 variables

ex) Solve $cx+dy \leq e$ (or $cx+dy \geq e$)

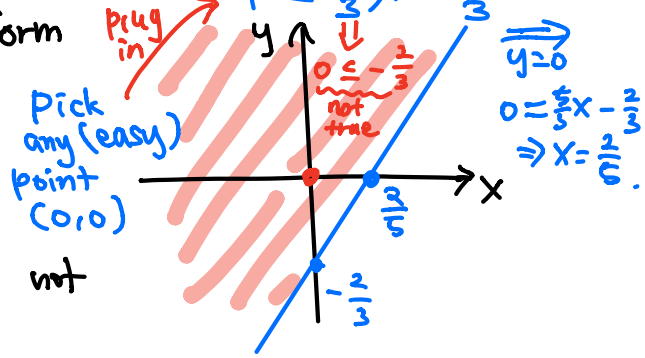
① put them in slope-intercept form "$y \leq mx+b$" (or $y \geq mx+b$)

② graph the inequality
- graph the line "$y=mx+b$"
- Shade the region which does not satisfy the inequality.

$5x-3y \geq 2$

$\Rightarrow -3y \geq -5x+2$

$\Rightarrow y \leq \frac{5}{3}x - \frac{2}{3}$

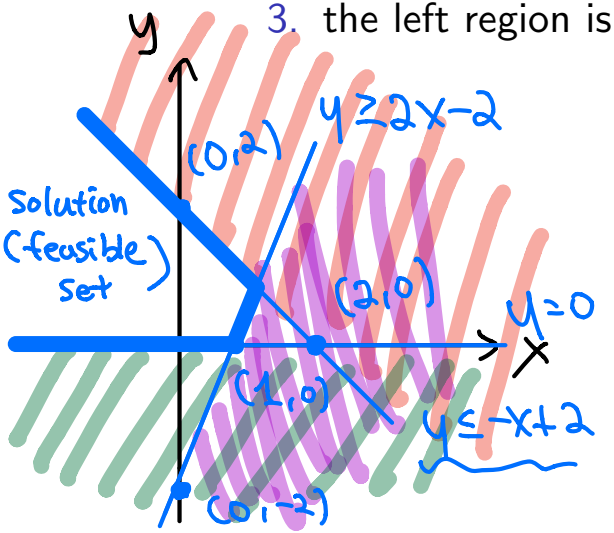


§3.2 Linear Programming Problem

- graphing a system of inequalities
  1. draw all the lines
  2. shade the region of the graph that does not satisfy the inequality
  3. the left region is the solution or feasible set

ex) $\begin{cases} x+y \le 2 \Rightarrow y \le -x+2 \\ 2x-y \le 2 \Rightarrow -y \le -2x+2 \Rightarrow y \ge 2x-2 \\ y \ge 0 \Rightarrow y \ge 0 \end{cases}$

$y=0$
$\Rightarrow 0=2x-2$
$\Rightarrow 2=2x$
$\Rightarrow x=1$



Pick (0,0)
$y \le -x+2$
$\Rightarrow 0 \le -0+2$
$\Rightarrow 0 \le 2$ (true)

Pick (0,0)
$y \ge 2x-2$
$\Rightarrow 0 \ge -2$ (true)

Pick (0,1).
$y \ge 0$
$\Rightarrow 1 \ge 0$ (true)

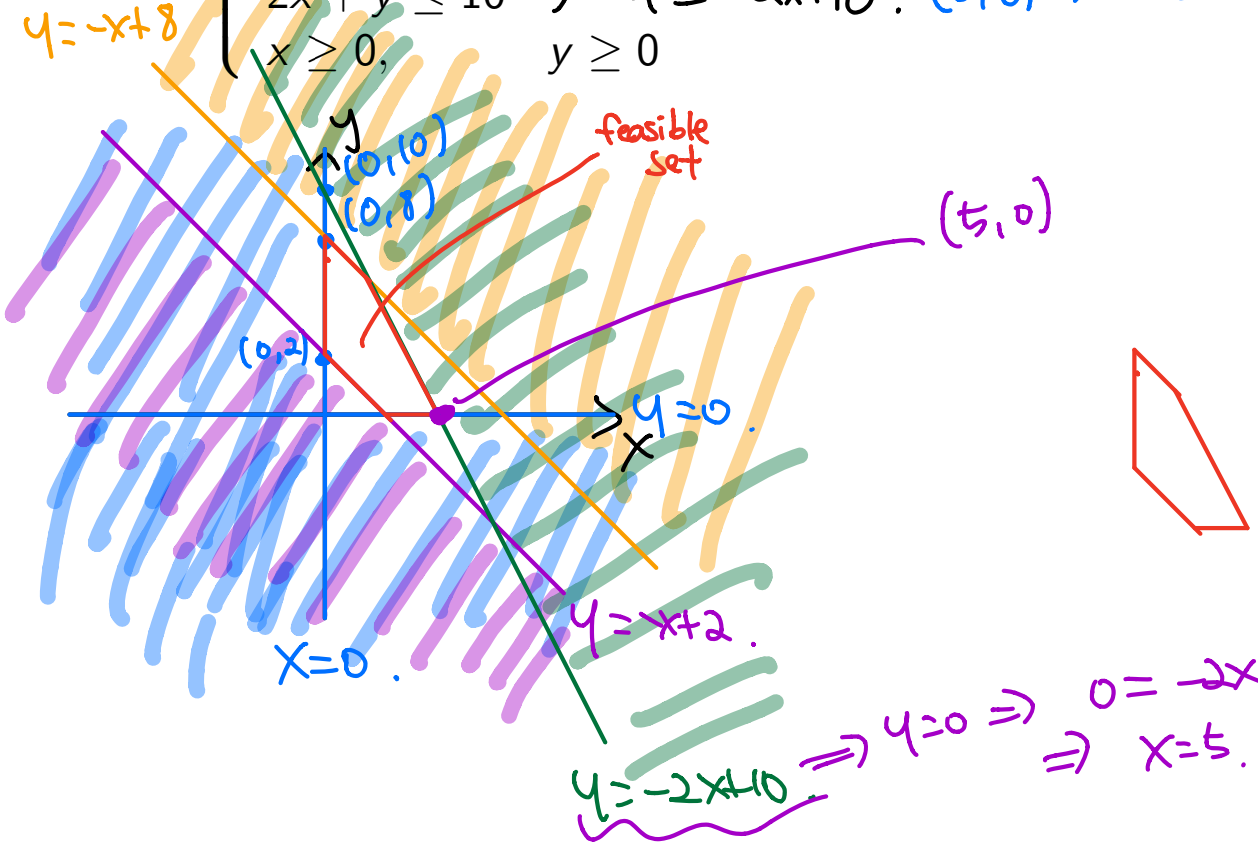
§3.2 Linear Programming Problem

ex)
$$\begin{cases} x+y \geq 2 \Rightarrow & y \geq -x+2 \\ x+y \leq 8 \Rightarrow & y \leq -x+8 \\ 2x+y \leq 10 \Rightarrow & y \leq -2x+10 \\ x \geq 0, & y \geq 0 \end{cases}$$

$(0,0) \Rightarrow 0 \geq 0+2$ (false)

$(0,0) \Rightarrow 0 \leq 0+8$ (true)

$(0,0) \Rightarrow 0 \leq 10$ (true)



$y=-2x+10 \Rightarrow y=0 \Rightarrow 0=-2x+10 \Rightarrow x=5$

§3.2 Linear Programming Problem

Goal maximize or minimize an objective function satisfying the system of constraints.