Inequalities

- basic inequalities: solve like an equation using +, -, *, and /
  - if you divide or multiply by a negative number --- the inequality sign flips
- check answer using a value in the solution set
- graphing: ○ open holes with <, >, ≠
  ● closed holes with ≤, ≥, =

Example: solve & graph $-y \geq \frac{y+6}{7}$

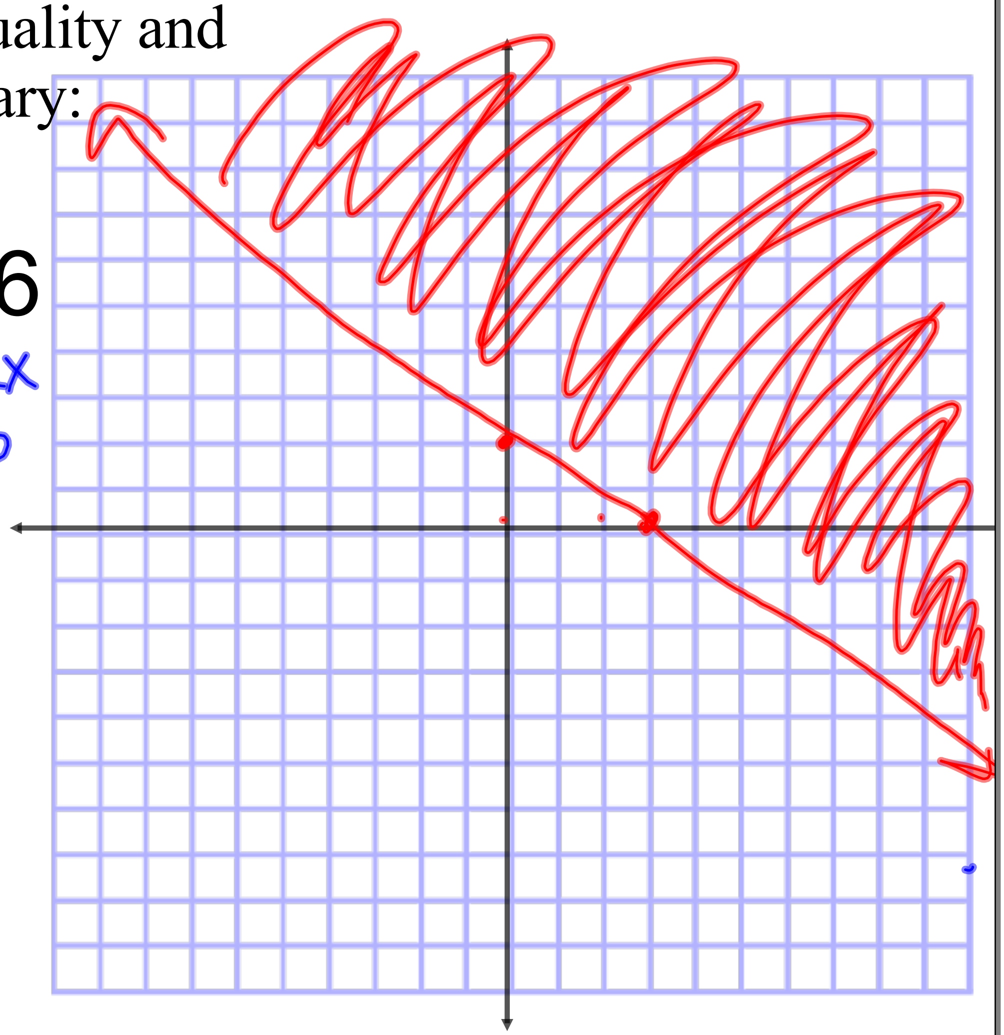
Graph the inequality and state the boundary:

$$2x + 3y \geq 6$$

$$-2x \qquad -2x$$

$$\frac{3y}{3} \geq \frac{-2x+6}{3}$$

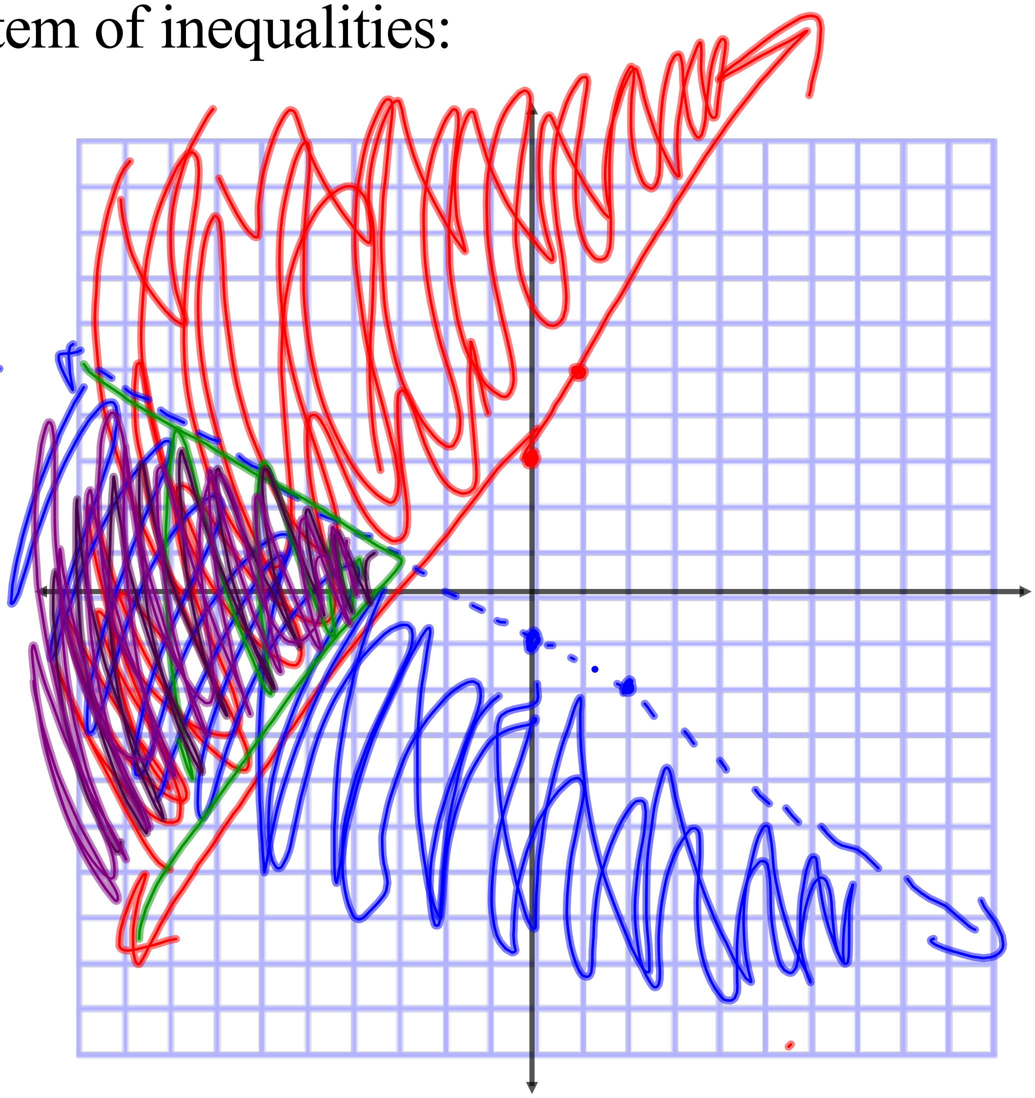
$$y \geq -\frac{2}{3}x + 2$$



Solve the system of inequalities:

$$y \geq 2x + 3$$

$$y < -\frac{1}{2}x - 1$$



Systems of Inequalities #64

Steps:

1. get each inequality in a form to graph (y -intercept form - remember if multi or divide by (-) switch sign)

2. graph each inequality $<, >$ dotted line

$\leq, \geq$ solid line

3. shade the region defined by each inequality

4. darken the overlapping region (if there isn't one then no solution exists, $\varnothing$)

Solve the system of inequalities:

$5x + 2y \le 20$

$y \le -\frac{5}{2}x + 10$

$2x + 3y \le 18$

$y \le -\frac{2}{3}x + 6$

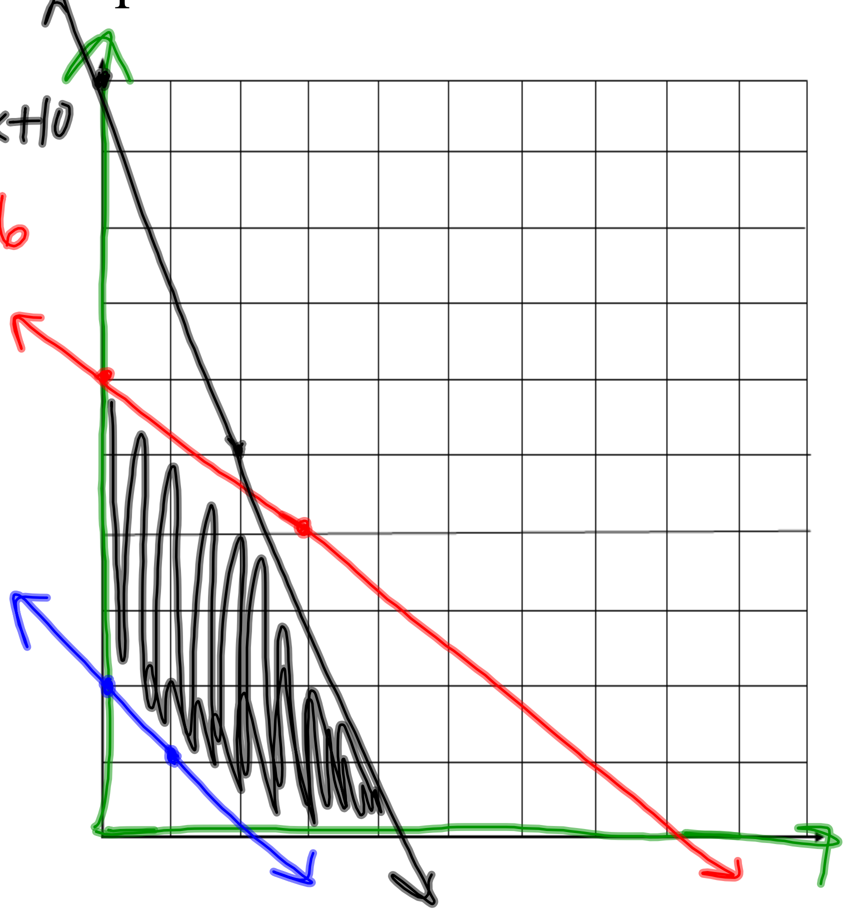
$x + y \ge 2$

$y \ge -x + 2$

$x \ge 0$

$y \ge 0$

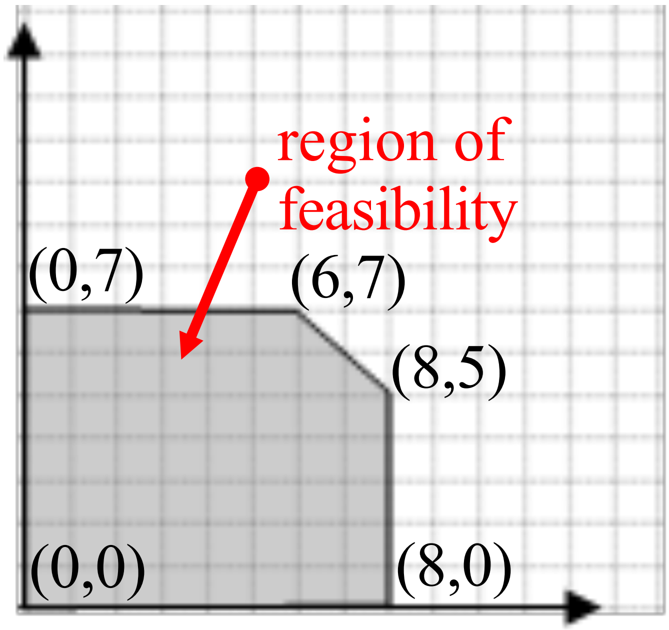
6



Find the max and min of the objective function:

$$f(x, y) = 2x - y$$

1. Find the vertices of the feasible region: (you find these by solving the system using the 2 lines that intersect)



2. Place them in the table.

3. Evaluate using the objective equation

4. The max and min are the largest and smallest number after evaluating

(x , y)	F(x, y) = 2x - y		F(x,y)
(0,0)	2(0)-(0)	=	0
(0,7)	2(0)-(7)	=	-7
(8,0)			

MAX: ____

MIN: ____

Linear Programming

#65

process used to find max or min value of a linear function subject to given conditions called constraints

Steps:

1.Graph the constraints - these are all of the inequalities that create a region of feasibility

2. Find the feasible region - this is the shaded region

3. Find the vertices of the region - these are the corners of the region

4. substitute each vertex (x,y) into the linear function (objective equation) and evaluate

5. Determine the max & min values & where those values occur

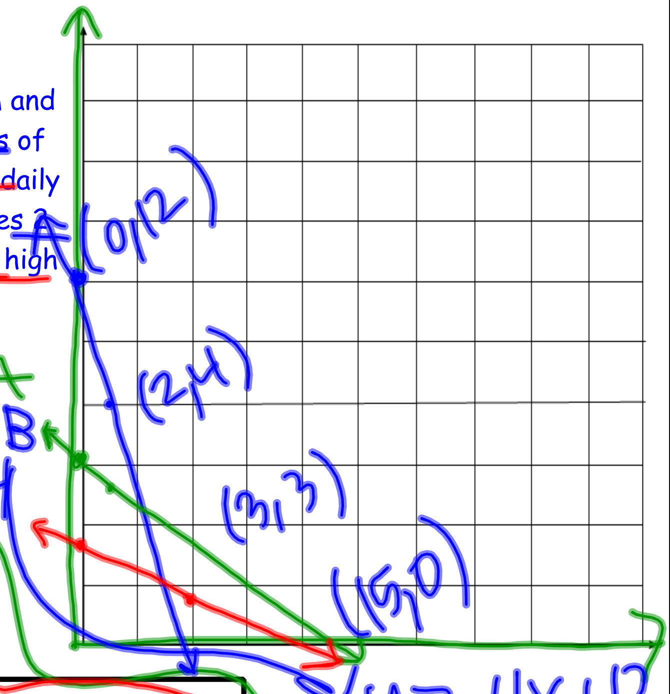
Some regions of feasibility are not bounded. If this happens you are not always able to evaluate a max or min value.

Gonza manufacturing has two factories that produces three grades of paper: low, medium and high grade. It needs to supply 24 tons of low grade, 6 tons of medium and 30 tons of high grade paper. Factory A produces 8 tons of low grade, 1 ton of medium grade, 2 tons of high grade daily and costs $2000 per day to operate. Factory B produces 2 tons of low grade, 1 ton of medium grade and 8 tons of high grade paper daily and takes $4000 per day to operate. How many days should each factory operate to fill the orders at minimum cost?

x = # of days F.A
y = # of days F.B

$2000x + 4000y$ ← objective function

$8x + 2y \geq 24$
$x + y \geq 6$
$2x + 8y \geq 30$



$y \geq -4x + 12$
$y \geq -x + 6$
$y \geq -\frac{1}{4}x + \frac{15}{4}$

(x,y)	2000x + 4000y	f(x,y)
0,12	2000(0)+4000(12)	48,000
2,4	2000(2)+4000(4)	20,000
3,3	2000(3)+4000(3)	18000

15,0

Open 3 days each