Finite Math - Spring 2019
Lecture Notes - 3/14/2019

Homework

- Section 5.1 - 1, 2, 3, 4, 9, 11, 13, 17, 29, 30, 52, 54
- Section 5.2 - 1, 3, 5, 7, 9, 10, 11, 12, 13, 16, 17, 18, 19, 20, 21, 24, 33, 38

Section 5.1 - Linear Inequalities in Two Variables

Graphing Linear Inequalities in Two Variables. There are 4 types of linear inequalities

$$Ax + By \geq C \qquad Ax + By > C$$

$$Ax + By \leq C \qquad Ax + By < C$$

There is a simple procedure to graphing any of these. If equality is not allowed in an inequality, we call it a *strict inequality*, otherwise we simply call it an inequality.

Procedure.

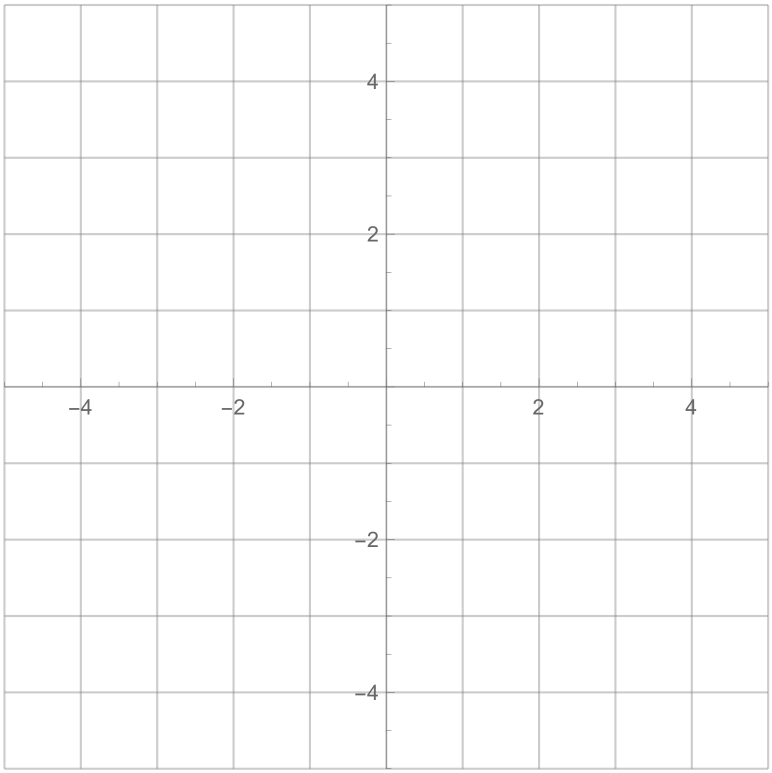
(1) *Graph the line* $Ax + By = C$ *as a dashed line if the inequality is strict. Otherwise, graph it as a solid line.*

(2) *Choose a test point anywhere in the plane, as long as it is not on the line. (The origin,* $(0, 0)$ *is often an easy choice here, but if it is on the line,* $(1, 0)$ *or* $(0, 1)$ *are also easy points to check.)*

(3) *Plug the point from step* (2) *into the inequality. Is the inequality true? Shade in the side of the line with that point. If the inequality is false, shade in the other side.*

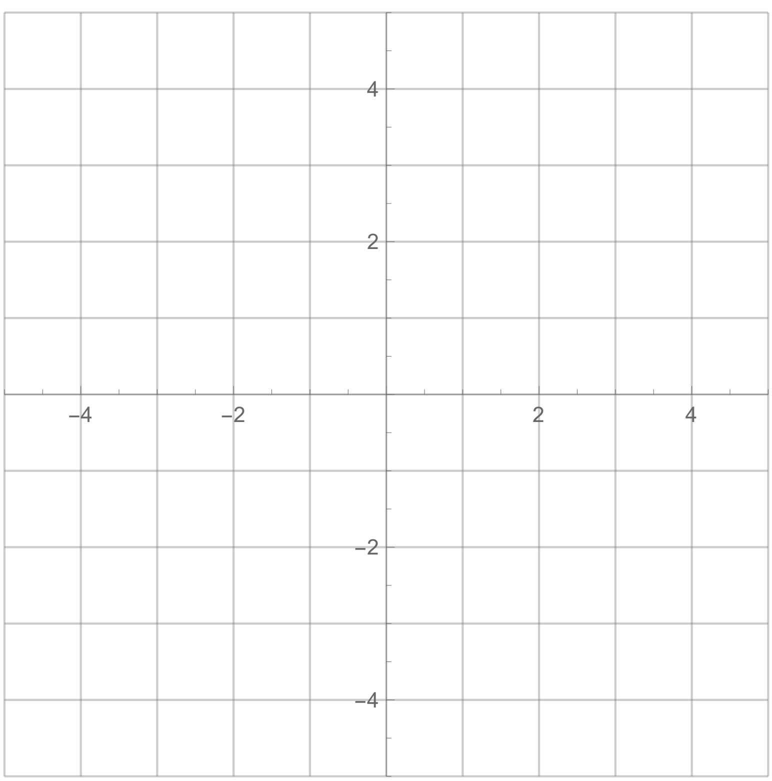
Example 1. *Graph the inequality*

$$6x - 3y \geq 12$$



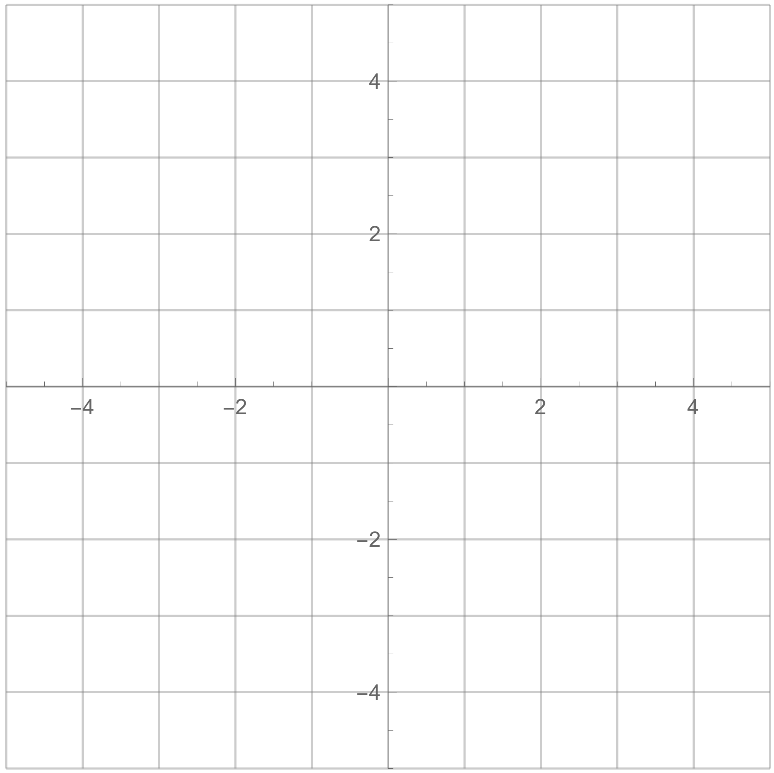
Example 2. *Graph the inequality*

$$4x + 8y < 32$$



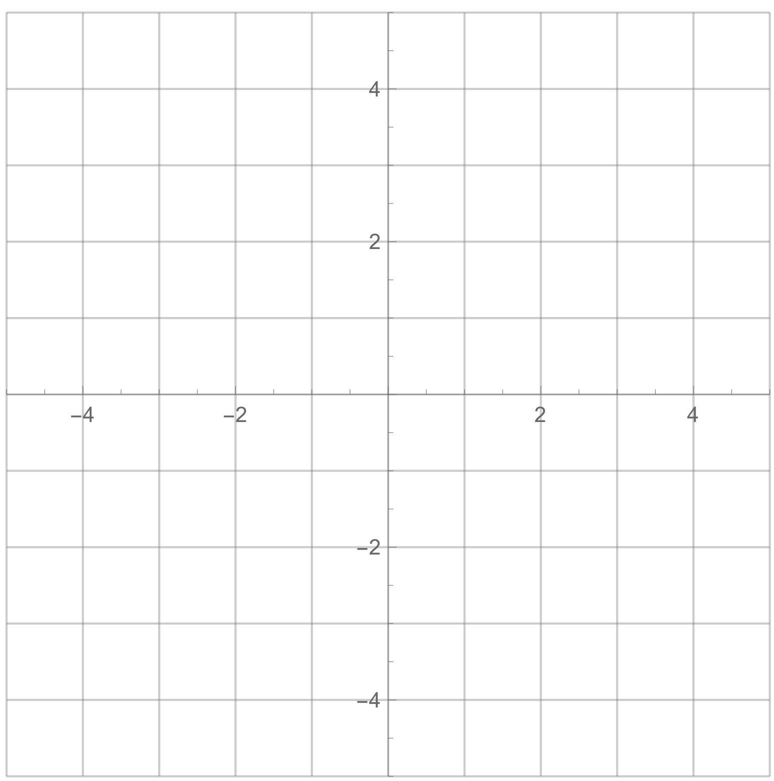
Example 3. *Graph the inequality*

$$2y \leq 10$$



Example 4. *Graph the inequality*

$$2x - 5y > 10$$



Section 5.2 - Systems of Linear Inequalities in Two Variables

Solving Systems of Linear Inequalities Graphically.

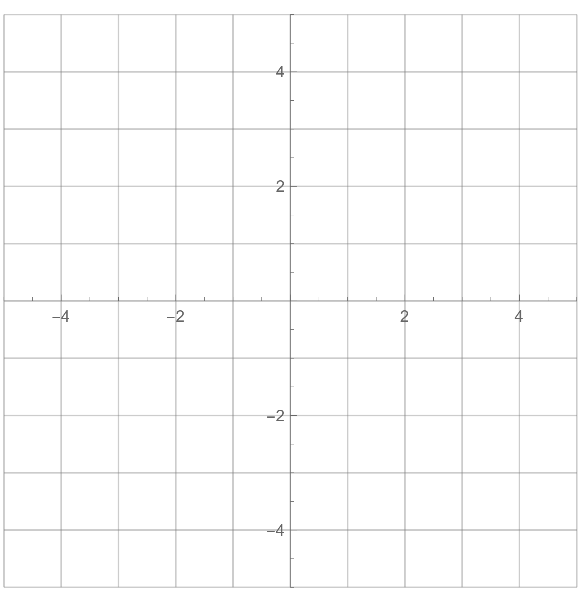
Definition 1 (Solution Region/Feasible Region)**.** *Given a system of inequalities, the* solution region *or* feasible region *consists of all points* (x, y) *which simultaneously satisfy all of the inequalities in the system.*

Example 5. *Solve the following system of linear inequalities graphically:*

$$\begin{array}{rcrcl} 3x & + & y & \leq & 21 \\ x & - & 2y & \leq & 0 \end{array}$$

Example 6. *Solve the following system of linear inequalities graphically:*

$$\begin{array}{rcrcl} 3x & + & y & \geq & 6 \\ x & - & 5y & \leq & 5 \end{array}$$



Definition 2 (Corner Point)**.** *A* corner point *of a solution region is a point in the solution region that is the intersection of two boundary lines.*

Example 7. *Solve the following system of linear inequalities graphically and find the corner points:*

$$\begin{array}{rcrcr} x & + & y & \leq & 10 \\ 5x & + & 3y & \geq & 15 \\ -2x & + & 3y & \leq & 15 \\ 2x & - & 5y & \leq & 6 \end{array}$$

Example 8. *Solve the following system of linear inequalities graphically and find the corner points:*

$$\begin{array}{rcrcl} 5x & + & y & \geq & 20 \\ x & + & y & \geq & 12 \\ x & + & 3y & \geq & 18 \\ & & x & \geq & 0 \\ & & y & \geq & 0 \end{array}$$

Definition 3 (Bounded/Unbounded)**.** *A solution region of a system of linear inequalities is* bounded *if it can be enclosed within a circle. If it cannot be enclosed within a circle, it is* unbounded*.*

Question. *Which of the regions in examples 1-4 are bounded? Which are unbounded?*