4.1 Linear Inequalities in Two Variables

Example 1: Graph \[ x - \frac{y}{3} < \frac{-2}{3} \].

Vocabulary:
- Test point
- Half-plane

System of Inequalities:
Two or more inequalities for which we want a solution (that fits all of them).
4.1 (cont)

Ex. 2. Graph solution set + label corners.

\[
\begin{cases}
4x + 3y \leq 240 \\
5x - y \leq 110 \\
x \geq 0 \\
y \geq 0
\end{cases}
\]
Ex 3  Graph solution set

\[3x + y \leq 9\]
\[3x + 2y \leq 12\]
\[x + 2y \leq 8\]
\[x \geq 0\]
\[y \geq 0\]
Ex 4: A firm manufactures two types of water bottles. One machine can produce 130 type 1 water bottles, and another machine can produce 120 type 2 water bottles (both per hour). The packaging department can only handle 230 total water bottles per hour. Write the inequalities that describe this situation and graph the solution set.
4.2 Linear Programming: Graphical Method

Ex 1 Find min and max values of objective function

\[ f = 4x + 3y \text{ on feasible region} \]

\[ \begin{align*}
2x + 3y & \leq 12 \\
4x - 2y & \leq 8 \\
x & \geq 0 \\
y & \geq 0.
\end{align*} \]

* See blue box, pg 295

Feasible region =>

Closed and bounded =>

Optimal solution =>

Optimal solutions occur at "corners"

* If no corners, may be no optimum values.
Ex 2  Minimize $g = 22x + 17y$ subject to

constraints

\[
\begin{align*}
8x + 5y & \geq 100 \\
12x + 25y & \geq 360 \\
x & \geq 0 \\
y & \geq 0
\end{align*}
\]
Ex 3 A contractor builds two types of homes.
The Carolina requires one lot, $160,000 capital, and 160 worker-days of labor, whereas the Savannah requires one lot, $240,000 capital, and 160 worker-days of labor. The contractor owns 300 lots and has $48,000,000 available capital and 43,200 worker-days of labor. The profit on the Carolina is $40,000 and the profit on the Savannah is $50,000. How many of each type of home should be built to maximize profit? What is the max profit?