

Lines and half-planes

math121-1-linprog Introduction to linear programming

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Lines

Need to be able to draw all sorts of lines

$$4x + 3y = 12$$

$$x + 2y = 4$$

$$3x + y = 3$$

Recall that the line $ax + by = c$ has $\mathbf{n} = (a, b)'$ as a normal vector.

Lines and half-planes

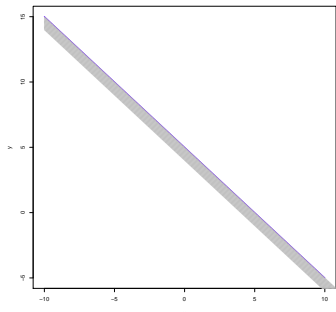
A straight line consists of the points (x, y) which satisfy $ax + by = c$.

The equation splits the plane into two half-planes, one on each side of the line.

The half-planes correspond to the conditions $ax + by < c$ and $ax + by > c$.

One is usually interested in viewing a half-plane which includes the line, e.g.

$$ax + by \leq c$$



Bounded and unbounded regions

In most cases one is interested in conditions of the form

$$ax + by \leq c$$

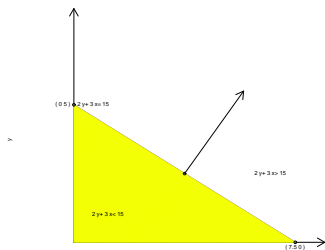
or

$$ax + by \geq c$$

with

$$x, y \geq 0$$

These regions may or may not be bounded.



Complicated regions

$$\begin{aligned}4x + 3y &\leq 12 \\x + 2y &\leq 4 \\3x + y &\geq 3 \\x &\geq 0 \\y &\geq 0\end{aligned}$$