Linear Programming

Definitions

Variables -- the goal is to find values for these

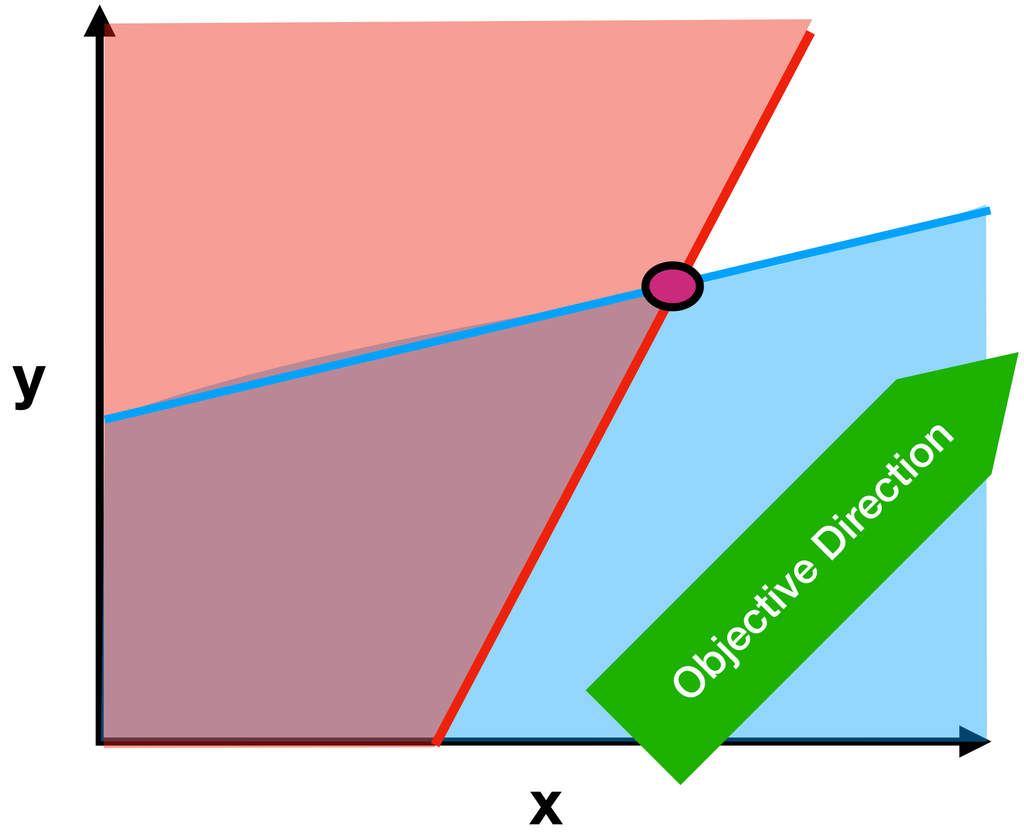
Objective Function -- a linear equation over the variables which will be maximized or minimized

Constraints -- linear inequalities that define what values of the variables are valid

Example

maximize **x+y**
subject to:
y - 3 x > - 4
3 y - x < 6

x=9/4 = 2.25
y=11/4 = 2.75

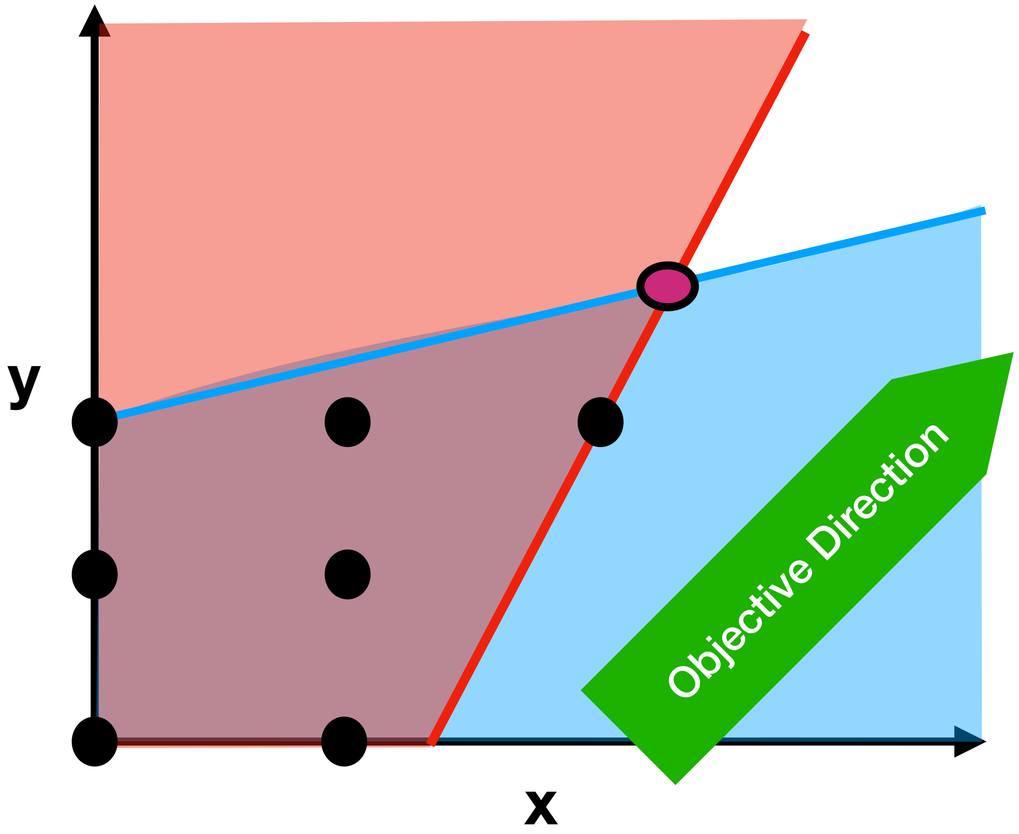


Integers

Same idea, but the variables have to be integer values.

maximize **x+y**
subject to:
y - 3 x > - 4
3 y - x < 6
x,y $\in \mathbb{Z}$

x=9/4 = 2.25
y=11/4 = 2.75



Solving (Integer) Linear Programs

TL;DR there are programs available to do this efficiently the details aren't important.

Solving an LP is actually polynomial time solvable

- ILPs is NP-Hard

Major solvers will solve both problems

- CPLEX (by IBM, closed source)
- GUROBI (closed source)
- COIN-OR (open source)

Where is LP used?

- Transcript Assembly
- Parameter Advising (don't know why I think this is important)
- Phylogeny
- Computational Auctions
- Business Workflow Optimization
- ....