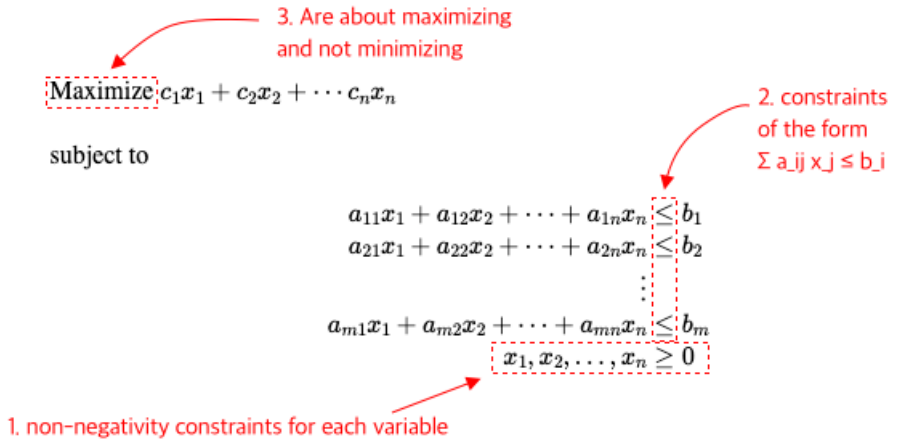
CSC373 Worksheet 6 Solution

August 12, 2020

1. **Notes:**

- **Linear Programming**
  - Is a method to achieve the best outcome (such as maximum profit or lowest cost) in a mathematical model whose requirements are represented by linear relationships. [1]
  - Is named to make it sound cool for government funding
    - Like dynamic programming
  - Applications
    - Microeconomics (maximize profits, minimize costs)
    - Company management
- **Standard Form**
  - Is a form of linear programming
  - Are about maximizing, not minimizing [2]
  - All have a positivity constraint for each variable [2]
  - All other constraints are all of the form "linear combination of variables $\leq$ constant". [2]



- **Converting Linear Programming to Standard Form**
  1) The objective function might be a minimization rather than a maximization
     - Negate coefficients of the objective function
  2) There might be variables without nonnegativity constraints
  3) There might be **equality constraints**, which have an equal sign rather than a less-than-or-equal-to sign
  4) There might be **inequality constraints**, but instead of having a less-than-or-equal-to-sign

Example:

Minimize

$$80x + 60y$$

subject to

$$\begin{aligned} x + y &\geq 1 \\ -.05x + .07y &\leq 0 \\ x,\ y &\geq 0. \end{aligned}$$

Introduce two new variables s_1, s_2 ≥ 0.
Convert inequalities to equalities

Minimize

$$80x + 60y$$

subject to

$$\begin{aligned} x + y - s_1 &= 1 \\ -.05x + .07y + s_2 &= 0 \\ x,\ y,\ s_1,\ s_2 &\geq 0. \end{aligned}$$

References:

1) Wikipedia, Linear Programming, link
2) Instituto de Mathematicas, Standard form for Linear Programs, link