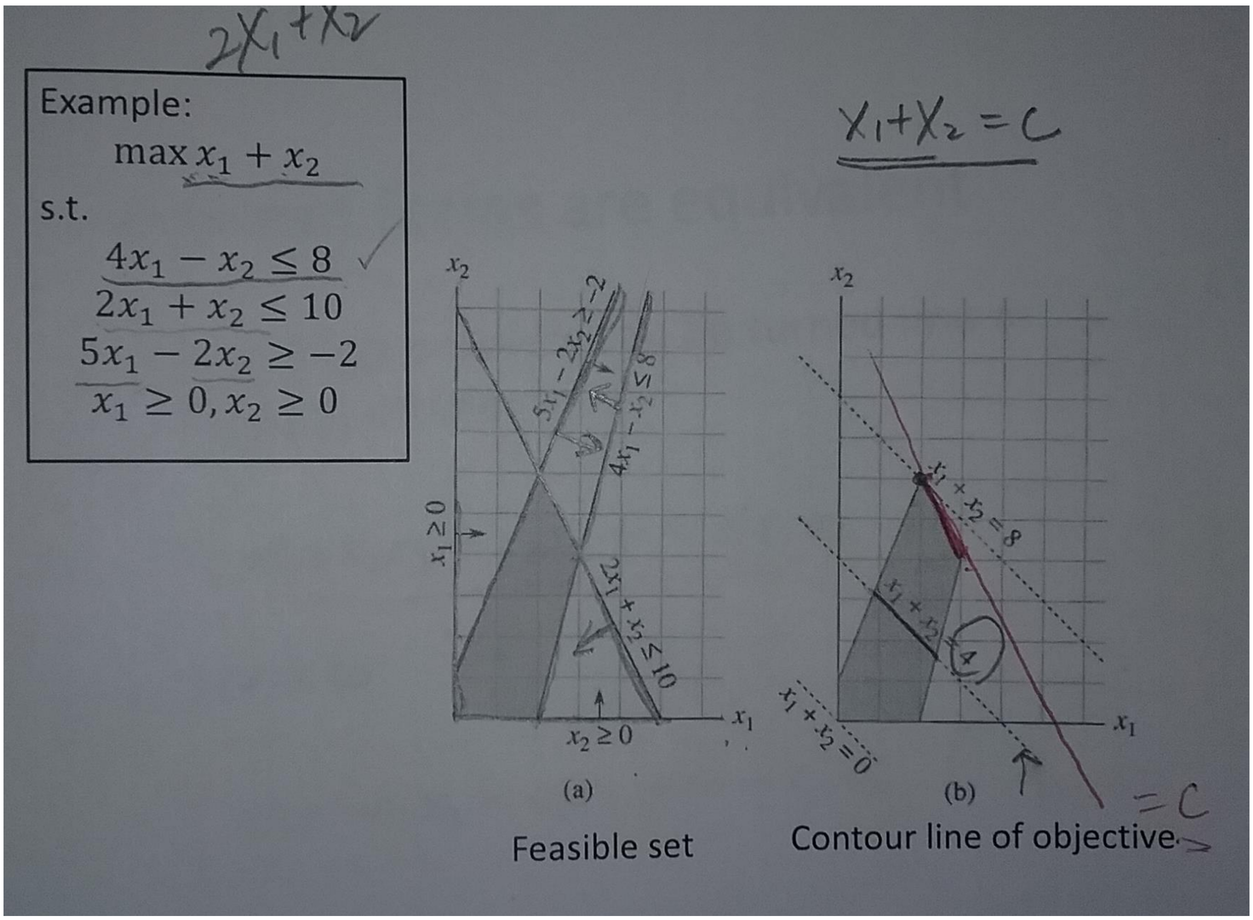
<u>Week 8 Day 2 Lecture Notes</u>

Prep:

- Quiz 4 in Class today.
- Implementation 3 on Canvas (Due end of 10^{th} week)
- Expect grades on Implementation 2 soon*
- Review Linear Algorithms.

Linear Problem Feasible set:



How to figure out the direction that satisfies the constraint?

- Plug in 0 for X and see if it satisfies.
- If it does than the left side of the contour line is the correct side.

$X_1 + X_2 = C$

Optimal solution:

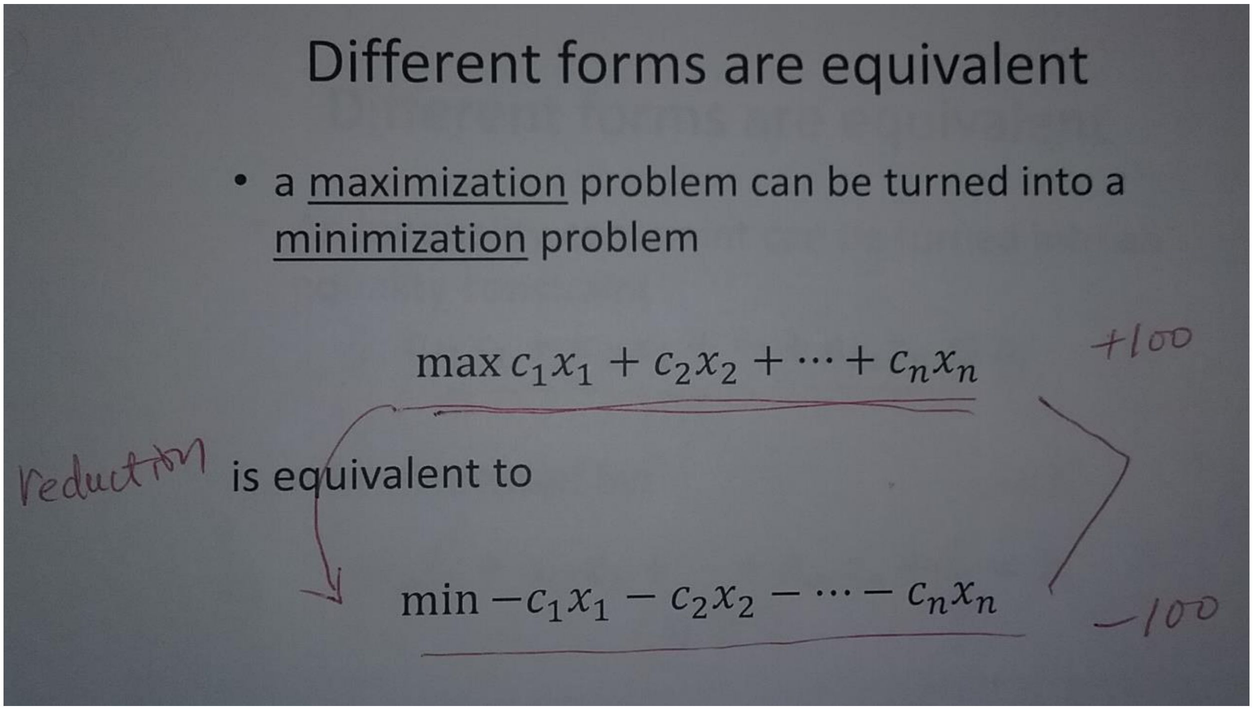
- is where the equation only touches at one point in the Feasible Set.
- If the equation is parallel to the constraint line and every point on the feasible Set can be optimal.

Thus we can limit our search to the two corners.

Canonical form of LP:

- Objective function must be maximized.
- Constraint must be in the form of less than or equal to. <=
- Variables must be non-negative. X >=0
- **Maximization, Constraints <=, x<=0.**

Different forms are equivalent:



- A Maximization problem can be turned into a Minimization Problem.
- Very easy to turn a Maximization Problem into a Minimization problem (Multiply by -1)
- This process is called **Reduction**

Eqality constraints can be expressed as two inequalities:

Ai1x1+…AinXn = bi

Is equivalent to

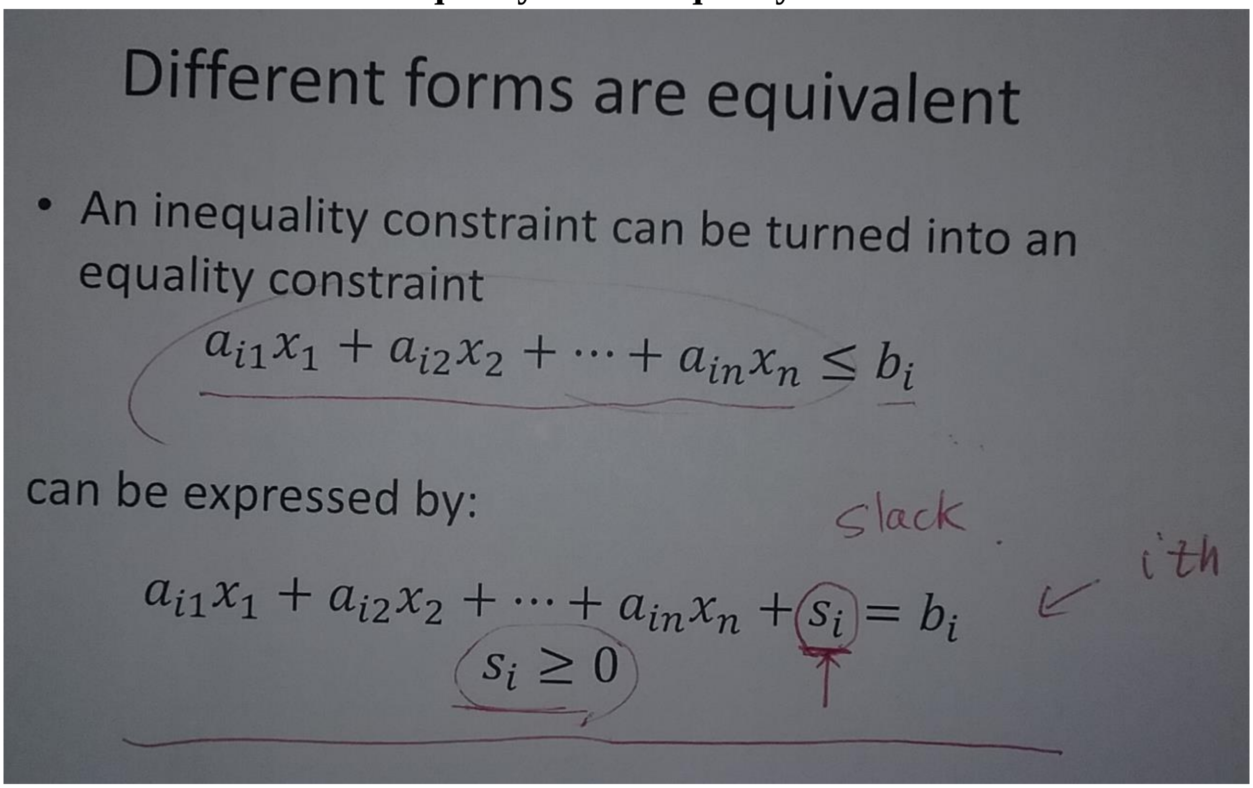
Convert equality into inequality.

Ai1x1+…AinXn <= bi

Ai1x1 +…AinXn >= bi

- This is also Reduction. Reduce a problem into an inequality constraint.

Also we can **convert an inequality into an equality**.



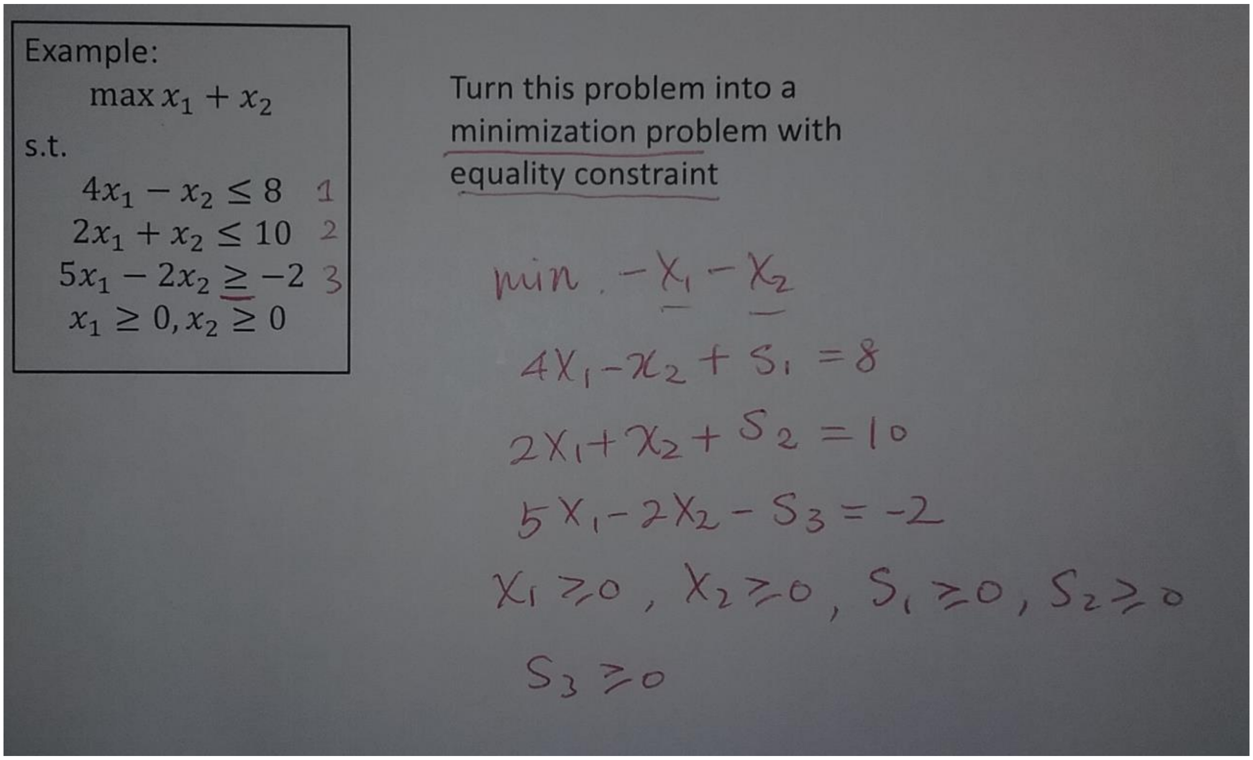
When converting to this way s_i must be >= 0.

If unrestricted it can be expressed by non-negative pairs.

- X^+ and X^- can replace X.

Reduction: Reduce from one form into another form.

Example of Turning problem into Minimization problem:



Skipped Example on LP formulation

More Examples of Reduction:

Given: A set of N data points. (x1,y1)…(xn,yn)

- Want to draw a linear model line that predicts y from x. (Regression)
- Want to minimize sum of absolute error.
- Least Squared Error

Next Time:

- Continue studying for final
- Quiz 5 Next week (Thursday)
- Work on Implementation 3.
- Review Linear Programming.

<u>End of Week 8 Day 2 Notes</u>

~Information composed by Notetaker Scott Russell for CS 325 **DAS** student