Due: Friday, November 7th (in class)

Reminders

Math 708 students must select a presentation topic and a date for the presentation. Please consult me if you have not done this.

Reading

Chapters 10 and 11. You can skip Section 11.6.

Problems for Math 408 and Math 708

1. Consider the set

$$X = \{x \in \mathbb{Z}^2_+ \mid 2x + 5y \leq 17, 2x + 2y \leq 11\}.$$

List and represent graphically the set of feasible points. Use this to find a minimal (facet) description of $\text{conv}(X)$.

2. Show that the system $\{x, y \in \mathbb{R}^2 \mid x+y \leq 0, x-y \leq 0\}$ is not TDI, but that if we add the redundant inequality $x \leq 0$, the system becomes TDI.

3. Chapter 8 problem 8.

4. Consider the following 0-1 knapsack polyhedron:

$$X = \{x \in B^6 \mid 5x_1 + 3x_2 + 8x_3 + 9x_4 + 13x_5 + 8x_6 \leq 15\}.$$

   1. What is the cover inequality corresponding to variables $\{1, 2, 3\}$?
   2. What is the dimension of the face of $P_I = \text{conv}(X)$ represented by this cover inequality?
   3. Lift the inequality you found in part (1) in variable 5, and then lift the resulting inequality in variable 6.

5. Chapter 9 problem 3. In part (ii), the first coordinate of the point to be cut is $\frac{1}{2}$, in early printings of the text it is misprinted as $\frac{1}{4}$.

Additional Problems for Math 708

6. Consider the stable set formulation from Chapter 9, problem 14. Take the graph G which consists of a 5-cycle and a single vertex v_6 attached to each vertex of the cycle. Such graphs are sometimes called *wheels*. The 5-cycle inequality is valid for the 5-wheel.

   1. What is the dimension of the face induced by the 5-cycle inequality? What is the dimension of the stable-set polytope of the 5-wheel?
   2. Lift this face to a facet by adding a term representing the variable x_6 to the inequality.

7. Chapter 8, Problem 14.

8. What are the facets of the symmetric travelling salesman polytope for the complete graph on 5 vertices?