Third Homework Assignment for Math 408 and 827

Due: Wednesday, October 29th, 2008, in class.

Note:

The midterm will take place in class on **Friday, October 24th** (11:30-12:30).

Problems for Math 408 and 827:

1. Chapter 7 problem 1. There is a typo in the book: please replace 35 by 31 in the lower right. All upper bounds are assumed to come from feasible solutions.
2. Chapter 7 problem 3.
3. Chapter 8 problem 2.
4. Chapter 8 problem 5.
5. Prove that the intersection of any two faces of a polytope P is also a face of P.

Additional problems for Math 827:

6. Chapter 7 problem 5. The *assignment relaxation* of the TSP requires only that the number of edges entering and leaving each vertex is 1.
7. Consider the integer program

$$\min x_{n+1} \quad \text{subject to} \quad 2x_1 + 2x_2 + \ldots + 2x_n + x_{n+1} = n \quad \text{and} \quad x \in \{0,1\}^{n+1}$$

Prove that if n is odd, a branch and bound algorithm (without using cuts) will have to examine at least $2^{\lfloor \frac{n}{2} \rfloor}$ candidate problems before it can solve the main problem.

8. Consider the problem of finding a maximum stable set of a graph (a maximum set of vertices with no two vertices sharing an edge). We can formulate this problem as:

$$\min \sum_{v \in V} x_v \quad \text{subject to} \quad x_{v_1} + x_{v_2} \leq 1 \quad \forall (v_1, v_2) \in E \quad \text{and} \quad x \in \{0,1\}^{|V|}$$

Show that for any complete subgraph (*clique*) W of G, you can obtain the clique inequality $\sum_{v \in W} x_v \leq 1$ by repeatedly applying Gomory (rounding) cuts.

Reading:

Chapters 8, 9 and 10.

Reminder:

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