Third Homework Assignment for Math 408 and 827

Due: Wednesday, March 7th, 2007, in class.

Problems for Math 408 and 827:

1.-3. Chapter 7 problems 1, 2, 3.

4.-5. Chapter 8 problems 2, 5.

Additional problems for Math 827:

6. Chapter 7 problem 11.

7. Consider the integer program

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

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 inequality $\alpha^t x \leq \beta$ where $\alpha \in \mathbb{Z}^n, \beta \in \mathbb{Z}$. Say that $\alpha^t x \leq \beta$ is an *integer consequence* of $Ax \leq b$ if there is a $u \in \mathbb{R}^M_+$ such that $\alpha = A^t u$ and $\lfloor u^t b \rfloor \leq \beta$. Say that $\alpha^t x \leq \beta$ is *integrally implied* by $Ax \leq b$ if $\{x | Ax \leq b, x \in \mathbb{Z}^n\} \subseteq \{x : \alpha^t x \leq \beta, x \in \mathbb{Z}^n\}$. Show that if $\alpha^t x \leq \beta$ is an integer consequence of $Ax \leq b$ then it is integrally implied by $Ax \leq b$, but not vice-versa.

Reading:

Chapters 8, 9 and 10.

Schedule of Presentations:

Graduate students have the option of presenting their talk either in class, on their selected Friday, or on the following Monday in the Operation Research Seminar (3:30, room SUR 14-400) or both. The OR Seminar will include audience members from the SFU commnity.

March 16th or 19th: Karel Casteels.

Michel X. Goemans and David P. Williamson, *Improved approximation algorithms for maximum cut and satisfiability problems using semidefinite programming*, J. Assoc. Comput. Mach. **42** (1995), no. 6, 1115–1145.

March 23rd or 26th: Arman Kaveh.

Sanjeev Arora, *Polynomial time approximation schemes for Euclidean traveling salesman and other geometric problems*, J. Assoc. Comput. Mach. **45** (1998), no. 5, 753–782.

March 30th or April 2nd: Annie Zhang.

Dimitris Bertsimas and Melvyn Sim, *Robust discrete optimization and network flows*, Math. Program., **98**, (2003), no. 1-3, Ser. B, 49–71.

Time and topic to be determined: Dan Benvenuti.

This schedule is subject to change.