First Homework Assignment for Math 408 and 708

Due: Wednesday, September 24th, in class.

All references are to the Wolsey text.

Problems for Math 408 and 708:

1. Chapter 1, problem 1.

2. Formulate the `Maximum Set Packing` problem as an integer program. This is the problem of finding the largest family of disjoint sets from a given collection of sets $\mathcal{C}$.

3. Chapter 1, problem 4.   Note that $B = \{0, 1\}$.

4. Chapter 1, problem 7.

5. A *magic square* is an arrangement of the numbers $1, 2, \ldots, n^2$ in an $n \times n$ box such that each row, column and diagonal has a constant sum. Formulate as an integer program the problem of finding a magic square maximizing the sum of the entries in its four corners.

Problems mainly for Math 708:

6. Chapter 1, problem 10.

7. Show that the integer program:

$$\max \quad x - \sqrt{2}y \qquad \text{such that } \{x \leq \sqrt{2}y, \quad x \geq 1, \quad x, y \text{ integer}\}$$

has feasible solutions with objective value arbitrarily close to zero, but no optimal solution.

8. Consider the problem of allocating storage (memory) dynamically in a computer. Model the memory as a simple array indexed by the positive integers. Suppose we are given a series of n requests to use an array of size s_i from arrival time r_i to departure time d_i. We would like to find the minimum memory size that will accommodate these requests (and a way to do it). Formulate this problem as an integer program.

Reading:

Chapters 1 and 2.