Second Homework Assignment for Math 408 and 708

Due: Wednesday, October 8th, 2008, in class.

Problems for Math 408 and 708:

1. We showed in class that the vertex-edge incidence matrices of all directed graphs and bipartite undirected graphs are totally unimodular. However, in general, the vertex-edge incidence matrices of undirected graphs are not totally unimodular. Show this.

2. Chapter 2 problem 2.

3. Chapter 2 problem 3.

4. Prove that a zero-one matrix, where, for each column, all the ones in that column are consecutive, is totally unimodular.

5. Chapter 6 problem 3.

Additional problems for Math 708:

6. Chapter 2 problem 4.

7. Chapter 3 problem 4.

8. Chapter 6 problem 5.

Reading:

Chapters 3, 6, 7 and 8.

Of interest:

The American Mathematical Society's 2008 Fall Western Sectional Meeting takes place October 4th and 5th at U.B.C. This will feature many interesting talks on mathematical topics ranging from general interest to current research. Discrete mathematics is very well represented at this meeting. For details, consult:

`http://www.ams.org/amsmtgs/sectional.html`

Prior to the meeting, there will be a special O.R. seminar this Friday by Imre Bárány at 3:30 in SUR 14-400.

Undergraduates may be interested in the Science Professional Panel on Thursday, October 2nd, 5:15 to 8:00 p.m. in SUR 3270 and 3290.

Presentations:

Math 708 students will give presentations of recent research papers either in class, on November 28th or December 1st, or in the Operations Research Seminar, on November 19th or 26th. Please sign-up for a date, first-come, first-served.

Please also choose a paper. I would like to finalize the choices by Wednesday, October 8th. The ideal situation would be to choose papers that are relevant to your own research. If you have, or are considering, and advisor, I recommend consulting with them.

A sample of interesting papers is below. These papers are all quite theoretical, more applied papers may also be suitable.

References

[ABGL02] K. Anstreicher, N. Brixius, J.-P. Goux, and J. Linderoth, *Solving large quadratic assignment problems on computational grids*, Math. Program. **91** (2002), no. 3, Ser. B, 563–588.

[BW03] Alexander Barvinok and Kevin Woods, *Short rational generating functions for lattice point problems*, J. Amer. Math. Soc. **16** (2003), no. 4, 957–979 (electronic).

[FK96] Michael L. Fredman and Leonid Khachiyan, *On the complexity of dualization of monotone disjunctive normal forms*, J. Algorithms **21** (1996), no. 3, 618–628.

[LS91] L. Lovász and A. Schrijver, *Cones of matrices and set-functions and* 0-1 *optimization*, SIAM J. Optim. **1** (1991), no. 2, 166–190.

[Seb90] A. Sebő, *Hilbert bases, Carathéodory's theorem and combinatorial optimization*, Integer Programming and Combinatorial Optimization (Waterloo, Ontario), University of Waterloo Press, 1990, pp. 457–484.

[SWZ95] Bernd Sturmfels, Robert Weismantel, and Günter M. Ziegler, *Gröbner bases of lattices, corner polyhedra, and integer programming*, Beiträge Algebra Geom. **36** (1995), no. 2, 281–298.

[TW96] Rekha R. Thomas and Robert Weismantel, *Test sets and inequalities for integer programs*, Integer programming and combinatorial optimization (Vancouver, BC, 1996), Lecture Notes in Comput. Sci., vol. 1084, Springer, Berlin, 1996, pp. 16–30. MR MR1441788 (98d:90077)

[Yan91] Mihalis Yannakakis, *Expressing combinatorial optimization problems by linear programs*, J. Comput. System Sci. **43** (1991), no. 3, 441–466.