

## Nathan Reff (Binghamton)

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### Gain Graphs, Group-Oriented Hypergraphs, and Matrices

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#### Abstract for the Combinatorics Seminar 2012 April 27

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There has long been interest in bounds for the eigenvalues of the adjacency and Laplacian matrices of a graph. I have extended some fundamental concepts from spectral graph theory to graphs with complex unit gains and have found new bounds for the Laplacian eigenvalues of a complex unit gain graph.

Motivated by the matrix results for complex unit gain graphs, I developed line graphs of gain graphs. As with graphs and signed graphs, there is a relationship between the incidence matrix of a complex unit gain graph and the adjacency matrix of the line graph. The line graph of a gain graph is defined using oriented gain graphs, a new structure that generalizes Zaslavsky's oriented signed graphs and their line graphs.

I will briefly mention how several of the matrix results for signed graphs and complex unit gain graphs generalize to hypergraphs via oriented hypergraphs and a new structure called group-oriented hypergraphs.

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This talk is Mr. Reff's dissertation defense. The public is welcome to attend. The examining committee is composed of Laura Anderson, Marcin Mazur, Darren Narayan (outside examiner from the Rochester Institute of Technology), and Thomas Zaslavsky (chair).

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