University of Lethbridge
Department of Mathematics
and Computer Science

Number Theory & Combinatorics Seminar

Monday — April 8, 2013
Room: B660
Time: 12:00 to 12:50 p.m.

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The maximum determinant problem

Abstract: Consider the set M_n of all matrices of order n with entries -1 and 1. The set $D_n = \{\det(A) : A \in M_n\}$ is a finite subset of integers. The maximum determinant problem deals with α_n; the largest possible value of the set D_n. The study of this (relatively old) problem has led people to some very interesting results and questions in number theory, combinatorics and statistics.

The following inequalities and the cases where equalities are attained will be discussed.

(1) For $n \equiv 0 \pmod 4$, $\alpha_n \leq n^{n/2}$. Equality occurs iff there is a $(1,-1)$-matrix H of order n with $HH^t = nI_n$.

(2) For odd n, $\alpha_n \leq \sqrt{2n-1}\,(n-1)^{(n-1)/2}$. Equality occurs iff there is a $(1,-1)$-matrix A with $AA^t = A^tA = (n-1)I_n + J_n$.

(3) For $n \equiv 2 \pmod 4$, $\alpha_n \leq (2n-2)\,(n-2)^{(n-2)/2}$. Equality occurs iff there is a $(1,-1)$-matrix B with

$$BB^t = B^tB = \begin{pmatrix} M & 0 \\ 0 & M \end{pmatrix},$$

where $M = (n-2)I_{n/2} + 2J_{n/2}$.

EVERYONE IS WELCOME!

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http://www.cs.uleth.ca/~nathanng/ntcoseminar/