

Discrete Mathematics Seminar

Time: Friday, 13 April 2012, 12:30–1:30 PM

Location: 238 Derrick Hall

Title: Rectangle-free subsets of the grid: a new approach to an asymptotic result for the Zarankiewicz problem

Speaker: Dr. Jacob Manske, Mathematics Department

Abstract:

Let k be a positive integer, and let $[k] = \{1, 2, \dots, k\}$. A rectangle in $[k] \times [k]$ is a subset of the form $\{(x, y), (x + d_1, y), (x, y + d_2), (x + d_1, y + d_2)\}$ for $x, y, d_1, d_2 \in \mathbb{N}$. In the 1950s, Zarankiewicz proposed the problem of finding $f(k)$, the size of the largest subset of $[k] \times [k]$ which does not contain a rectangle. In 1958, Kövari, Sós, and Turán were able to show that $\lim_{k \rightarrow \infty} \frac{f(k)}{k^{3/2}} = 1$.

In this talk, we provide a survey of previous results, current state of the research on this and related problems (including new directions taken by Fenner, Gasarch, Glover, and Purewal in 2010), and a new proof of the 1958 result of Kövari, Sós, and Turán which relies on a connection to projective planes, utilizing a lemma from Mendelsohn in 1987.