

A MIGHTY Prelude

a special student seminar
58th Midwestern Graph Theory conference

October 6, 2017

Grand Valley State University
Allendale, Michigan

4–5pm Invited address 1101 Kindschi Hall of Science

Equilateral and almost-equilateral sets in \mathbb{R}^n

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Abstract: An *equilateral set* is a set of points any two of which are the same distance apart (so the vertices of an equilateral triangle form an equilateral set in the plane, and the vertices of the regular tetrahedron form one in space). It's well known that the largest equilateral set in n -dimensional space has size $n + 1$. While this is a geometric fact, it admits a lovely linear algebra proof.

In 1962 Danzer and Grünbaum asked how large a set can be if it is *almost* equilateral — pairs of points are close to the same distance apart. They made the reasonable conjecture that the largest almost-equilateral set is never much larger than the largest equilateral set. Twenty years later, Erdős and Füredi spectacularly disproved this using a probability argument.

Erdős and Füredi's work was highly non-constructive. Nicely illustrating that one can never predict where a mathematical problem is going to go next, recently Zakharov, a high-school student in Moscow, revisited the linear algebra approach, and improved on Erdős and Füredi's result — this time in a completely constructive way.

I'll talk about some of this work, and mention a few nice open questions.

5–7pm Undergraduate student poster session and
pizza social

Please register so we can plan for enough pizza. To present a poster, apply when registering.



www.gvsu.edu/math/mighty-lviii