

Colloquium

University of Notre Dame
Department of Mathematics

Speaker: Andrew Marks

University of California at Berkeley

Will give a lecture entitled

Squaring the circle via definable graph combinatorics
and hyperfiniteness

Date: Wednesday, September 20, 2023

Time: 4:00 PM

Location: 129 Hayes-Healy Hall

Departmental Tea: Tea in Room 257 (lounge in Hurley Hall) at 3:30 p.m.

Zoom URL: <https://notredame.zoom.us/j/99986867672?pwd=Z2NJRIZwL0dTR0Nxbk50NEIHK0dNdz09>



Abstract:

In 1925 Tarski posed the problem of whether a solid two dimensional square can be partitioned into finitely many pieces which can be rearranged by isometries to form a disk of the same area. In 1990 Laczkovich positively answered Tarski's question using the axiom of choice. Joint with Spencer Unger we show that there is an explicitly definable Borel solution to this problem. Our solution uses recent progress in two major research programs in descriptive set theory. First, the theory of descriptive graph combinatorics, which studies definable/measurable solutions to combinatorial problems on infinite graphs. At their combinatorial core, equidecomposition problems like Tarski's circle squaring problem are perfect matching problems, and progress on the theory of definable matchings is central to our solution. Second, the study of the descriptive-set-theoretic complexity of actions of countable groups. In particular, our proof uses a recent result of Gao-Jackson-Krohne-Seward on the hyperfiniteness of actions of abelian groups. Finally, we discuss some recent results showing the circle can be squared using algebraic translations, and bounding the number of pieces used.