

Illustrating Number Theory and Algebra

Workshop Show'n'Tell

October 22 -23, 2019

Seeing Algebraic Curves and Surfaces

Sebastian Bozlee, University of Colorado, Boulder

I will briefly present programs illustrating how algebraic curves and surfaces fit in projective space, then present a concept for visualizing the complex points of planar curves.

Diagrammatic Algebra

Scott Carter, University of South Alabama

I will outline the definition of a multi-category that is freely generated by a weakly invertible object.

Number Theory and Noise

ICERM/Berkeley

We describe a process to create sounds from positive integer sequences, and discuss it's appeal as an exploratory research project for undergraduates and highschool students.

Twitter Bots for Existence Theorems

Tom Edgar, Pacific Lutheran University

We discuss recent construction of two twitter bots created to intrigue readers about two existence theorems - the sum of three triangles and sum of four squares theorems - with a visual component.

Unfolding Complex Trees with n -fold Rotational Symmetry

Bernat Espigulé, Universitat de Barcelona

In this lightning talk I will shows how the angles and ratios of side to diagonal in regular polygons generate an interesting family algebraic numbers associated to self-similar sets with n -fold rotational symmetry. A diagram illustrating this family of algebraic numbers is provided along with some examples of self-similar sets generated by these numbers.

Braid Groups and Knitting by Dan Isaksen

Rebecca Field, James Madison University

An illustration of the difference between a limit of topological spaces and the completion of said limit using knitting.

The Minimal Euclidean Function on the Gaussian Integers

Hester Greaves, IDA/CCS

Illustrating the Abel-Jacobi Map

Sachi Hashimoto, Boston University

We will give a brief description of an illustration of a genus 2 curve embedding into its Kummer surface, the Jacobian mod the (-1) -involution.

Sporadic Groups and Puzzles

Alexander E Holroyd, University of Washington

The positions of a twisty puzzle like Rubik's Cube form a finite group, with the puzzle moves being generators. What groups are possible? What about sporadic groups? So far as I know, exactly four such puzzles exist, all of them yielding the same sporadic group. I'll present arguably the only one that is really practical as a physical puzzle, devised and made at the current ICERM program.

Visualizing Arithmetic Hyperbolic Lattices and Sphere Packings/Bugs

Alex Kontorovich, Rutgers University

We will discuss recent progress in understanding Apollonian-like sphere packings and more general objects, with connections to arithmetic hyperbolic groups, both reflective and non.

Approximation Properties for Backwards and Standard Continued Fractions

Matthew Litman, University of California, Davis

Continued fractions (CF) give the best rational approximations of real numbers with respect to many metrics. In this talk, we show how many of these approximation properties can be derived from analogous ones for `\textit{backwards}` continued fractions, whose natural construction comes from a well-ordering property that the CF case does not have. (Joint work with Cameron Bjorklund.)

Using p-adic Valuations to Generate Fractal-Like Images

Vincent J. Matsko

The choice of which angle to turn in producing a Koch snowflake may be determined by using a 2-adic valuation (mod 2). Other interesting curves, many with central symmetry, may be produced by using a p-adic valuation (mod 2) to determine angle choices, where p is a positive integer (not necessarily prime).

Drawing Dessins

Michael Musty, ICERM

This talk is a quick introduction to Belyi maps and the task of drawing their associated dessins d'enfants.

Skew Hook Tilings and Specht Modules

Robert Muth, Washington & Jefferson College

I will discuss how tilings of Young diagrams via skew hook shapes, which follow Tetris-like rules, can be used to connect some standard KLR algebra modules with Specht modules of the symmetric group.

Sol LeWitt's Incomplete Open Cubes as Embeddings of Cubical Graphs

Natasha Rozhkovskaya, Kansas State University

Variations of Incomplete Open Cubes is the major project by the twentieth-century conceptual artist Sol LeWitt. We interpret the enumerative component of the project as embeddings of graphs. Our conclusion is that the artist found the correct number of structures, but that his list contains a minor mistake in the presentation of a pair of incomplete cubes. The presentation is based on the joint paper by N. Rozhkovskaya and M. Reb.

A Visual Investigation into Prime Numbers

Jennifer Shin, 8 Path Solutions LLC, New York University

Prime numbers have been investigated by mathematicians for centuries. New tools, particularly computers, have enabled scientists new methods for analyzing the behavior of prime numbers, but technology also present limitations can be restrictive and mislead. In this talk, I will share visualizations I created to evaluate prime numbers to navigate around real world constraints and the finiteness of compute, technology, and resources.