PARTICIPANT TALKS THURSDAY, AUGUST 11

5:00 pm, R251 (the barn): three talks before dinner; dinner at 6:00, five later talks

Speakers, Titles, and Abstracts

Michael Cronin

Title: Combinatorial Game Theory and Surreal Numbers

Abstract: Beginning with the definition of games as ordered pairs of sets whose elements are also games, we investigate the recursive nature of games and prove Conway induction as well as the fundamental theorem of combinatorial game theory. Then, we define addition and multiplication of games, revealing Games to be a partially ordered group. Then we show that the class of surreal numbers is equivalent to the collection of numerical games and show that the class of surreal numbers forms an ordered group that has some interesting properties with connections to other groups.

Teodoro Collin

Title: Finding the Probability Density Function of the Eigenvalues of the Gaussian Unitary Ensemble

Abstract: We will find the probability density function of the eigenvalues of the GUE. In doing so, we will encounter tricky implementations of several classic techniques for finding density functions. After finding the density up to a normalization constant, we will evaluate the normalization constant with Selberg's integral formula. We will prove Selberg's integral formula by transforming the integral into an integral over monic polynomials.

Diego Bejarano

Title: Treetops and the cut spectrum

Abstract: Ultrafilters play an important role in model theory. Hence it is only natural to want to understand them in their own right. This talk explores some of the interesting properties of regular ultrafilters and how these properties are related.

DINNER

Sun Woo Park

Title: Zeta Functions over a Finite Field

Abstract: I will give a very rough sketch of the proof that the zeta function over a finite field is a p-adic meromorphic function, meaning that it is a quotient of two p-adic power series with infinite radius of convergence. As an example, I will also calculate some zeta functions over finite fields, showing that they are in fact rational, a stronger condition than being p-adic meromorphic.

Hannah Santa Cruz

Title: Monodromy groups of Algebraic functions

Abstract: We will explain why it is pertinent to assign a permutation group or a braid group to an algebraic function, and see how to construct these monodromy groups. We will then look at what these groups tell us about the functions, and will end by giving a sketch of the Abel Ruffini Theorem using the permutation groups.

Julian Salazar

Title: Algebraic Functions and the Representability Zoo

Abstract: Why can't the quintic be solved by radicals (Abel-Ruffini)? Why do the cubic and quartic formulas require nested radicals (Farb)? Are 3-variable algebraic functions compositions of 2-variable ones (Hilbert's 13th)? We unify these as questions of representability, with brief glimpses of how Galois theory, algebraic geometry, and algebraic topology are brought to bear on these questions.

Holly Mandel

Title: What Does a Lie Algebra Know About a Lie Group?

Abstract: A Lie group is a smooth manifold with a smooth group law. A Lie algebra, by contrast, is an abstract vector space with a strange-looking binary operation. Nevertheless, every Lie group has an associated Lie algebra, and the study of Lie algebras allows us to completely classify certain families of Lie groups. In my talk, I will explain how the vector fields on a Lie group gives rise to a Lie algebra. From there, I will illustrate how this Lie algebra encodes information about the group law and state the major facts of the Lie Group-Lie Algebra correspondence.

Noam Kantor

Title: Topological Inspirations in Number Theory

Abstract: We'll take a quick run through the fundamental ideas in Deligne's proof of the Riemann Hypothesis over finite fields. In the process we'll discuss two ideas that moved from topology to number theory: the lefschetz fixed point theorem and model categories.