Brian Conrey, American Institue of Mathematics

Random matrix theory and ranks of elliptic curves

Abstract: Among squarefree numbers, it appears from computations that those integers congruent to 16 modulo 63 are twice as likely to be a sum of two rational cubes as are numbers congruent to 17 modulo 63. That this assertion is correct is a conjecture, due to Mark Watkins, obtained by mixing together elliptic curves, L-functions, and random matrix theory. In this lecture, we will explain how to arrive at Watkins' conjecture.

Bill Duke, UCLA

Some new results about the j-function

Paul Young, College of Charleston

A 2-adic formula for Bernoulli numbers of the second kind

Abstract: We give a formula expressing Bernoulli numbers of the second kind as 2-adically convergent sums of traces of algebraic integers. We use this formula to prove and explain the formulas and conjectures of Adelberg concerning the initial 2-adic digits of these numbers. We also give analogous results for the Nörlund numbers and p-adic analogues for odd primes p, including a version of Kummer's congruences.

Ognian Trifonov, University of South Carolina

Covering systems of congruences

Hui Xue, Clemson University

Minimal resolution of some arithmetic curves

Abstract: We will study the regular model of the arithmetic curve $X_0(p^n N)/w_p$, where w_p is the Atkin-Lehner involution at p.

Frank Thorne, University of Wisconsin

Maier matrices beyond $\mathbb{Z}$

Abstract: A "Maier matrix" is a combinatorial device used to prove the existence of irregular and unusual behavior in the distribution of the primes and related arithmetic sequences. After giving a general overview of the method, I will discuss my work in extending the method to the polynomial ring $\mathbb{F}_q[t]$ and to rings of integers of certain imaginary quadratic fields. In particular, we will obtain natural analogues of 'irregular distribution' results proved by Maier, Shiu, and Granville-Soundararajan.

Mark Shattuck, University of Tennessee

Polynomial generalizations of the r-Fibonacci and r-Lucas numbers

Abstract: We'll look at two new polynomial generalizations of the r-Fibonacci and r-Lucas sequences which are gotten by q-counting certain statistics on linear and circular r-mino arrangements, respectively. We study both algebraic and combinatorial properties of these polynomials, including recurrences, closed forms, generating functions, and various Fibonacci/Lucas identities. Special attention is paid the case $q = -1$.

Dan Baczkowski, University of South Carolina

On rational numbers associated with arithmetic functions evaluated at factorials

Abstract: Florian Luca established that for a fixed $r \in \mathbb{Q}$, there are a finite number of positive integers n and m for which $f(n!) = r \cdot m!$ where f is one of the arithmetic functions d (the number of divisors function), ϕ (Euler's ϕ-function), or σ (the sum of the divisors function). We establish a generalization of these results, in particular a consequence of our work is the following: Let k be a fixed positive integer. Then there are finitely many positive integers n, m, a and b such that

$$b \cdot f(n!) = a \cdot m!, \quad \gcd(a, b) = 1 \quad \text{and} \quad \omega(ab) \leq k$$

where $\omega(\cdot)$ denotes the number of distinct prime divisors function.

Luis Finotti, University of Tennessee

Lifting the j-invariant

Abstract: The j-invariant of the canonical lifting of an ordinary elliptic curve can be described as a Witt vector of rational functions on the j-invariant of the elliptic curve in characteristic p. The formulas seem to be well defined for some supersingular j-invariants, yielding "pseudo-canonical liftings". In this talk, it will be shown that, modulo p^2, $j = 0$ and $j = 1728$ have pseudo-canonical liftings for any characteristic.