

Number Theory
Abstracts

Saturday 3:15 – 5:15

Melaine Matchett Wood, AIM & University of Wisconsin
Bianca Viray, Brown University
Jennifer Balakrishnan, Harvard University
Kristin Lauter, Microsoft Research

Sunday 8:30 – 10:30

Renate Scheidler, University of Calgary
Cristina Ballantine, College of the Holy Cross
Brooke Feigon, University of East Anglia
Marie-France Vigneras, Institut de Mathematiques de Jussieu

Saturday 3:15 – 5:15

TITLE

Melaine Matchett Wood, AIM & University of Wisconsin

ABSTRACT

Descent on elliptic surfaces and transcendental Brauer elements

Bianca Viray, Brown University

Transcendental elements in the Brauer group are notoriously difficult to compute. Wittenberg and Ieronymou have worked out explicit representatives for 2-torsion elements of elliptic surfaces, in the case that the Jacobian fibration has rational 2-torsion. We use ideas from descent to develop techniques to study the 2-torsion elements of elliptic surfaces without an assumption on the 2-torsion of the Jacobian.

Computations with Coleman integrals

Jennifer Balakrishnan, Harvard University

The Coleman integral is a p -adic line integral that can encapsulate valuable information about the arithmetic and geometry of curves and abelian varieties. For example, certain integrals allow us to find rational points or torsion points; certain others give us p -adic height pairings. I'll present a brief overview of the theory, describe algorithms to calculate some of these integrals, and illustrate these techniques with numerical examples computed using Sage.

Constructing genus 2 curves for cryptography

Kristin Lauter, Microsoft Research

Jacobians of genus 2 curves can be used in cryptography, but constructing

curves which are appropriate to use requires deep methods from number theory, including the theory of complex multiplication. This talk will explain some of these methods, including Igusa class polynomials and the conjecture of Bruinier and Yang.

Bruinier and Yang conjectured a formula for an intersection number on the arithmetic Hilbert modular surface, $CM(K).T_m$, where $CM(K)$ is the zero-cycle of points corresponding to abelian surfaces with CM by a primitive quartic CM field K , and T_m is the Hirzebruch-Zagier divisors parameterizing products of elliptic curves with an m -isogeny between them. In this talk, we examine fields not covered by Yang's proof of the conjecture. We give numerical evidence to support the conjecture and point to some interesting anomalies. We compare the conjecture to both the denominators of Igusa class polynomials and the number of solutions to the embedding problem stated by Goren and Lauter.

This project was initiated at the WIN workshop in Banff in November 2008, and is joint work with: Bianca Viray, Jennifer Johnson-Leung, Adriana Salerno, Erika Frugoni and Helen Grundman.

Sunday 8:30 – 10:30

Classification and Symmetries of a Family of Continued Fractions With Bounded Period Length

Renate Scheidler, University of Calgary

It is well-known that the continued fraction expansion of a quadratic irrational is symmetric about its centre; we refer to this symmetry as horizontal. However, an additional vertical symmetry is exhibited by the continued fraction expansions arising from a certain one-parameter family of positive integers known as Schinzel sleepers. This talk investigates the period lengths as well as both the horizontal and vertical symmetries of this family. We also outline a method for generating all Schinzel sleepers. This is joint work with Kell Cheng, Richard Guy and Hugh Williams.

Ramanujan bigraphs associated with $SU(3)$ over a p -adic field

Cristina Ballantine, College of the Holy Cross with Dan Ciubotaru

We use the representation theory of the quasisplit form G of $SU(3)$ over a p -adic field to investigate whether certain quotients of the Bruhat-Tits tree associated to this form are Ramanujan bigraphs. We show that a quotient of the tree associated with G (which is a biregular bigraph) is Ramanujan if and only if G satisfies a Ramanujan type conjecture. This result is analogous to the seminal case of $PGL_2(\mathbb{Q}_p)$ considered by Lubotzky, Phillips and Sarnak. As a consequence, Rogawski's classification of the automorphic spectrum of the unitary group in three variables implies the existence of certain infinite families of Ramanujan bigraphs.

L-functions and periods

Brooke Feigon, University of East Anglia

I will describe recent work relating L-functions to periods.

TITLE

Marie-France Vigneras, Institut de Mathematiques de Jussieu

ABSTRACT