SOUTHERN CALIFORNIA NUMBER THEORY DAY, NOVEMBER 7, 2009

ABSTRACTS

David Grant, *Serre curves in one-parameter families* (joint work with Alina Cojocaru and Nathan Jones.)

Serre famously proved that for elliptic curves E over number fields k without complex multiplication, the galois group H of the field generated over k by all the torsion points E_{tor} of E is a subgroup of finite index in $G = \varprojlim \mathrm{GL}_2(\mathbb{Z}/n\mathbb{Z})$. When $k = \mathbb{Q}$, the smallest the index of H in G can be is 2, and if it is, we say E is a Serre curve over $\mathbb{Q}$. Now let E be an elliptic curve over $\mathbb{Q}(t)$. So long as the galois group generated over $\mathbb{Q}(t)$ by E_{tor} is all of G, "almost all" specializations t_0 of t in $\mathbb{Q}$ give rise to elliptic curves E_{t_0} which are Serre curves, and if we consider those t_0 of height bounded by some B, we give bounds for the number of E_{t_0} which are not Serre curves in terms of B.

Everett Howe, *Genus bounds for curves with fixed Frobenius eigenvalues*

This talk is based on joint work with Noam Elkies and Christophe Ritzenthaler.

Suppose you are given a finite set S of simple abelian varieties over a finite field k. Is there a bound on the genera of the curves over k whose Jacobians are isogenous to products of powers of elements of S?

Serre, using results of Tsfasman and Vladuts, showed that the answer is yes. We give explicit bounds on the genus, in terms of the "Frobenius eigenvalues" (the roots of the characteristic polynomials of Frobenius) of the elements of S.

We show, for example, that the maximal genus of a curve over $\mathbf{F}_2$ whose Jacobian splits completely (up to isogeny) into a product of elliptic curves is 26—a bound that is attained by a certain model of the modular curve $X(11)$.

Ken Ono, *Generalized Borcherds products and two number theoretic applications*

At the 1994 ICM in Zurich, Borcherds introduced the notion of an automorphic infinite product. In this lecture I will discuss joint work with Jan Bruinier which gives automorphic infinite products arising from harmonic Maass forms. We will discuss two number theoretic applications:

(1) Partitions,
(2) Central derivatives of modular L-functions.

Rachel Pries, *Alternating group covers of the affine line and Abhyankar's Inertia Conjecture*