

Speaker: William Chen

Title: Markoff triples, Nielsen equivalence, and nonabelian level structures

Abstract: Following Bourgain, Gamburd, and Sarnak, we say that the Markoff equation $x^2 + y^2 + z^2 - 3xyz = 0$ satisfies strong approximation at a prime p if its integral points surject onto its F_p points. In 2016, Bourgain, Gamburd, and Sarnak were able to establish strong approximation at all but a sparse (but infinite) set of primes, and conjectured that it holds at all primes. Building on their results, in this talk I will explain how to establish strong approximation for all but a finite and effectively computable set of primes, thus reducing the conjecture to a finite computation. Using the connection between the Markoff surface and the character variety of $SL(2)$ representations of the fundamental group of a punctured torus, this result becomes a corollary of a more general divisibility theorem on the cardinalities of Nielsen equivalence classes of generating pairs of finite groups, which in turn follows from a simple observation regarding the degree of a certain line bundle on the moduli stack of elliptic curves with nonabelian level structures. As time allows we will also describe some applications.