Michigan Mathematics
Sumner Myers Prize Colloquium

Professor Bryden Cais

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From Differential Forms to Galois Representations (and back again): A Survey of Serre's Conjecture

Since the time of the ancient Greeks, mathematicians have been interested in understanding solutions of equations with rational coefficients. In modern times, it is customary to study the field of all solutions to all equations at once; thanks to Galois, we now know that the absolute Galois group of the rationals acts on this space, and encodes a wealth of information about its structure. This is a very rich and complicated group, so to glimpse its inner workings we are led to study its representations. The 1-dimensional case was the "crown jewel" of nineteenth century algebraic number theory, and there is a largely conjectural framework for classifying arbitrary representations, initiated by Langlands in the 1970's, which asserts a profound link between algebra, geometry, and analysis. I will survey in a down-to-earth manner a specific instance of this framework, namely Serre's conjecture on 2-dimensional mod p Galois representations, which provides a precise dictionary for translating between such representations and holomorphic differential forms on certain algebraic curves. I will then explain how this dictionary translates refined representation-theoretic phenomena into congruence conditions between differential forms.

Department of Mathematics
Friday, March 21, 2008
4:00 p.m. • Room 1360 East Hall

A reception for Professor Cais will be held in the Mathematics Atrium immediately following the talk.