

GRADUATE STUDENT SEMINAR

Guest Speaker: Eric Wawerczyk

University of Notre Dame

Date: Monday, October 3, 2016

Time: 4:00 PM

Location: 129 Hayes-Healy Hall

Lecture Title:

Dreams of a Number Theorist: The left side of the right-half-plane

Abstract

Euler studied the Harmonic series, the sums of reciprocals of squares, cubes, and so on. Chebyshev was able to package these together in the zeta function, defined for a real number greater than 1. Riemann had the idea of defining the function for complex numbers and found that this infinite series converges as long as the real part of the imaginary number is greater than 1. He then uses the inverse mellin transform of the Theta Function (see: modular forms) to derive the "functional equation" which gives a UNIQUE meromorphic extension to the whole complex plane outside of the point $s=1$ (harmonic series diverges=pole). This unique extension is called the Riemann Zeta Function. For over 150 years Number Theorists have been staring at the left side of the right half plane. We will explore this mysterious left hand side throughout the talk and its relationship to Number Theory. This will serve as our prototypical example of Zeta Functions. Finally, we will discuss generalizations of the zeta functions (Dedekind Zeta Functions, Artin Zeta Functions, Hasse-Weil Zeta Functions) and our daunting task of extending all of them to their own left sides and what mysteries lie within (The Analytic Class Number Formula, The (proven) Weil Conjectures, the Birch and Swinnerton-Dyer conjecture, The Langlands Program, and the (proven) Taniyama-Shimura Conjecture, the Grand Riemann Hypothesis)