

COURSE ANNOUNCEMENT

FALL 2009

MATH 595: Asymptotic Methods in Analysis

Time/Location: TuTh 9:30 - 10:50, 343 Altgeld Hall

Instructor: A.J. Hildebrand, 241 Illini Hall, phone 244-7721, email ajh@uiuc.edu

Course description: This course is an introduction to classical asymptotic methods such as the Laplace method, the saddle point method, and Abelian and Tauberian theorems. These methods have a wide variety of applications in both Pure and Applied Mathematics, but are usually not covered in the standard undergraduate or graduate curriculum. The course will focus on applications in number theory (e.g., the Hardy-Ramanujan asymptotic formula for the partition function), combinatorics (e.g., asymptotic formulas for Stirling and Bell numbers), and analysis (e.g., the asymptotic behavior of Bessel functions).

Prerequisites: A good mastery of real and complex analysis at the level of Math 447/448 is essential, and students should feel at ease with $\epsilon - \delta$ arguments. No specific background in number theory or combinatorics is required.

Text: I plan to distribute my own lecture notes. As supplementary references (though not required texts), I would recommend the following books: "Asymptotic Methods in Analysis" by N. G. de Bruijn, which is available in an inexpensive Dover paperback edition; and "Concrete Mathematics" by Graham/Knuth/Patashnik, which contains a chapter "Asymptotics" that gives an introduction to the subject at the undergraduate level. De Bruijn's book is classic text on the subject by one of the masters of Asymptotic Analysis, but it is written in very concise style and is not an easy read. The Graham/Knuth/Patashnik book, on the other hand, only introduces the basics of asymptotic analysis (though it does so very well), but does not cover more sophisticated methods such as the saddle point method. The course will strike a balance between the levels of these two books.