MTH 449/549: Advanced Number Theory, Fall
MTH 410/510: Topics in Number Theory, Winter
MTH 610: Topics in Number Theory, Winter
Instructor: J. J. P. Veerman

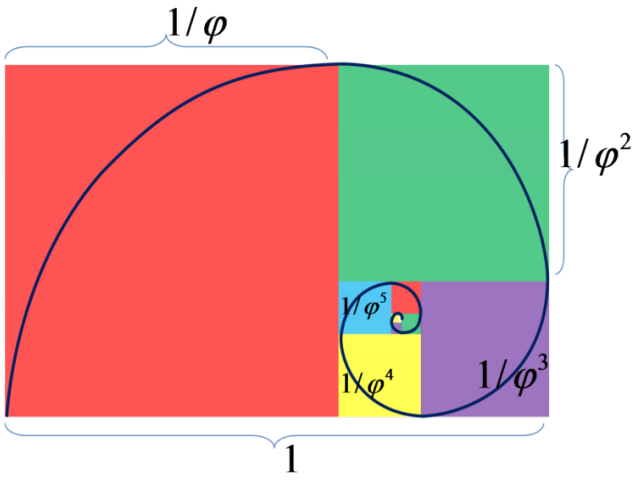
MTH 449/549 serves as a first course in number theory at the advanced graduate or beginning graduate level. No prior knowledge of number theory is assumed. We do require knowledge and familiarity with the notions of basic linear algebra (matrices, determinants), calculus (integrals), and proof-writing. We cover topics like unique factorization, Möbius inversion, modular arithmetic, Fermat and Mersenne primes, the theory of continued fractions.

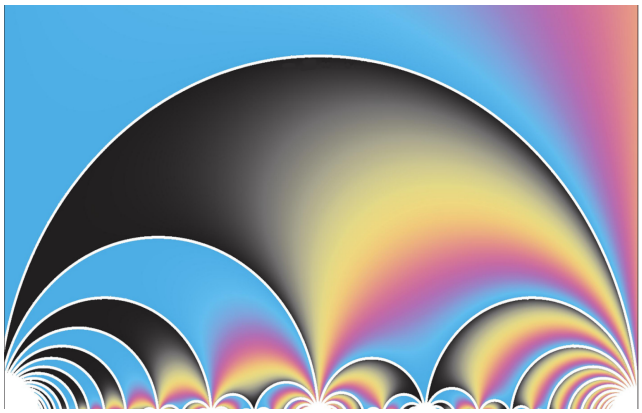
MTH 410/510 serves to familiarize the student with the principal notions of the different branches of number theory. We study elements of ergodic theory applied to the Gauss map and characterize the continued fraction coefficients for "typical" numbers. We study elements of complex analysis and prove the prime number theorem using a method developed in the 1980's (analytic number theory). And finally, we will discuss the basic principles of algebraic number theory, guided by the study of algebraic number fields and their rings of integers in the complex plane.

MTH 610 serves to delve a bit more in depth in some topics. Possibilities are Galois theory, Birkhoff's ergodic theorem, irrationality and transcendence of certain numbers (like π and e), counting the number of finite abelian groups. Dirichlet's theorem on primes in arithmetic progressions, the distribution of $\ln p \bmod 1$ (where p are primes), and so on.

The aim in these courses is to become familiar with the major theorems and principles of the different branches of number theory, an understanding of how they fit together, and how these topics connect to the bigger picture of some of the core branches of mathematics: algebra, analysis, and complex analysis. Many of the concepts in these areas, were (partly) motivated by applications in number theory. This course provides a great way to see these broad areas of math in a whole new light (the necessary background is part of the course).

We aim for a division of roughly equal parts between blackboard type lecturing and interactive practice in the form of exercises for the student.





Textbooks:
1) J. J. P. Veerman, *An Introduction to Number Theory*, Lecture Notes available for free via
`http://web.pdx.edu/~veerman/0_mainfile.pdf`.

Expected preparation for MTH 449/549: MTH 346 or consent of instructor.
Recommended preparation for MTH 410/510: MTH 346 or MTH 449/549 or consent of instructor.
Recommended preparation for MTH 610/510: MTH 410/510 or consent of instructor.