Math 597b Bounded gaps in the primes Spring 2015, Syllabus

Class #:464332

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Office Hours:	MWR 2:30-3:30 and otherwise by arrangement.
Class:	TR 9:45-11:00 Room MB113

There is no set text but the following give useful background:

H. L. Montgomery & R. C. Vaughan, Multiplicative Number Theory I. Classical Theory, Cambridge University Press, xii + 516pp, 2006.
(1) Harold Davenport, Multiplicative Number Theory, third edition revised by Hugh Montgomery, Springer-Verlag, 2000.
(2) Gérald Tenenbaun, Introduction to Analytic and Probabilistic Number Theory, Cambridge University Press, 1995, ISBN 0521412617.

Homework: Due every Tuesday.

Grading: Based on Homework and Attendance.

Topics

Recently there have been a number of sensational developments in prime number theory.

1. Goldston, Pintz and Yildirim showed that there are relatively small gaps between primes.

2. Zhang adapted their method to show that there are infinitely many pairs of primes p, p' with $0 < p - p' < 70 \times 10^6$ and Maynard has improved the bound to $p - p' < 700$.

3. Green and Tao have shown that there are arbitrarily long arithmetic progressions in the primes.

4. Helfgott has shown that every odd $n > 5$ is the sum of three prime numbers.

Topics covered include the following. The large sieve, the Selberg sieve, Bombieri's theorem on primes in arithmetic progression, which says that GRH is true on average. We will also discuss Vinogradov's three primes theorem and a proof that almost all even natural numbers are the sum of two primes. The highlight will be a proof of Maynard's theorem on bounded gaps in the primes. Some aspects of the refinements of Green, Maynard, Tao and Zahn will be discussed.

All Penn State Policies, http://www.psu.edu/ufs/policies/, regarding ethics and honorable behavior apply to this course.

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