

Topics for Comprehensive Exam based on Math 788K

General. No need to memorize proofs of any theorems, but be able to use the theorems and techniques of the proofs. The main topics for the Comp will be **Schnirelmann Theory of set addition, simple upper bounds for sieve functions**, and normal/average behavior of some arithmetic functions. The section on the circle method will not be covered.

Schnirelmann theory. Various types of densities; theorems of Schnirelmann and Mann; notions of **basis, essential component, complimentary sets** (Lorentz' Theorem), Cauchy-Davenport-Chowla Theorem. The proof of Waring's problem will not be covered.

Sieve theory. General sieve problem (notations), idea of Brun; main upper bound result (Theorem 18) and how to use it (with Iwaniec condition, Merten's theorem, etc.) in applications. The proof of Theorem 18, and covering congruences, will not be covered. The stuff on arithmetic progressions, and the circle method will not be covered.

Normal/average values of arithmetic functions. Average values of $\omega(n)$, $\Omega(n)$ and proof; Hardy-Ramanujan Theorem (Theorem 30) and how to use it to prove Theorem 31 on the normal order of $\omega(n)$ and $\Omega(n)$; deduction of Theorem 32 on the normal behavior of $\tau(n)$, the number of divisors of n ; Turan-Kubilius theorem. The Erdős-Kac theorem, and applications to shifted primes and the distribution of $\phi(n)$ will not be covered.

For sample problems, look over the appropriate homework exercises.