

# Syllabus for Math 70100, Fall 2019

Prof. Hooper

This course is the first of two classes which are intended to prepare students for passing the qualifying exam in analysis. I expect to cover all the material for this course listed in the topics for the qualifying exam here:

[http://www.gc.cuny.edu/CUNY\\_GC/media/CUNY-Graduate-Center/PDF/Mathematics/Real-Syllabus.pdf?ext=.pdf](http://www.gc.cuny.edu/CUNY_GC/media/CUNY-Graduate-Center/PDF/Mathematics/Real-Syllabus.pdf?ext=.pdf)

## Tentative Course Syllabus

### Background material:

- The real number system
- Cardinality (Countable and uncountable sets)

### Point-Set Topology:

- Metric Spaces and Normed Linear Spaces
- Topological spaces
- Continuous maps
- Connectedness
- Nets
- Compactness
- Topology in  $\mathbb{R}^n$ : The Heine-Borel and Bolzano-Weierstrass Theorems
- Tychonoff's Theorem
- The Baire-Category Theorem

### Function spaces:

- The uniform norm
- The Arzela-Ascoli Theorem.
- The Stone-Weierstrass Theorem
- The Urysohn Metrization Theorem

**Differentiation in  $\mathbb{R}^n$ :**

- Definition and elementary properties of the derivative
- Inverse and Implicit Function Theorems

**Other topics depending on time and interest:**

- Elements of Functional Analysis
- Measure theory in  $\mathbb{R}$  and  $\mathbb{R}^n$
- Dynamical Systems