Math Camp

This course is a brief review of basic mathematical concepts and an introduction to some more specialized tools that will be used throughout the first year PhD/rMSC coursework.

Logistics

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This course is intended for students preparing to take the first year coursework, familiarity with real analysis and linear algebra is encouraged.

Course Materials

Course Slides are posted to the course website. These slides are not exhaustive, and do not replace lectures.

The official textbook for this course is "Mathematics for Economists" (Simon and Blume 1994).

Course Structure

This course will be structured as follows.

- There are 5 series of videos on mycourses/dropbox covering the material listed below.
- The class times will focus primarily on problem solving. We'll spend the in class time each day working through problems related to the video content. You are responsible for watching each set of videos *before* the corresponding session of the course.
- The in-class sessions are focused on problem sets. Students are expected to

actively work on problems, and engage in discussion of how to solve problems.

- In addition, I'll give 3 quizzes. These will review the weeks material and at least somewhat mimic the final exam in terms of format, time constraints, etc.
- There is no virtual alternative to these in class sessions.

Grading

The course will be assessed through a final exam. Each problem set and quiz you submit on time is worth 5 bonus points on the final. The in-class problems are graded based on "completion", in the sense that you'll receive full credit if you put in a good faith effort to complete the problem set. There are a total of 120 possible points on the final.

Topics to be Covered

- Analysis (Topology in Euclidean space)
  - Open/Closed Sets
  - Sequences and Limits
  - Compactness
  - Continuity (of functions and correspondences)
- Analysis
  - Some linear algebra (Linear independence, quadratic forms)
  - Multivariate calculus (partial derivatives)
  - Implicit Function Theorem
  - Convexity/concavity
  - Fixed Point Theorems (Brouwer and Kakutani)
  - Separating Hyperplanes
  - Envelope Theorem
- Optimization

  - Existence and Uniqueness of Maxima/Minima
  - Unconstrained Optimization
  - Constrained Optimization with equality constraints (Lagrange Multipliers)
  - Constrained Optimization with inequality constraints (Karush Kuhn Tucker conditions)
  - Berge's Maximum Theorem

- Probability
  - Probability
  - Random Variables
  - Expected Value
  - Markov and Chebyshev's inequality
  - Joint distributions
  - The law of large numbers
  - Conditional distribution

Schedule

- Day 1 - Quiz covering material from previous courses
- Day 2 - Analysis
- Day 3- Calculus
- Day 4 - Convex Analysis
- Day 5 - Quiz (week 1 material)
- Day 6 - Optimization
- Day 7 - Probability
- Day 8- Quiz (week 2 material)
- Day 9 - Review

Teaching times are listed on Sisu/mycourses, with the one exception that there will be no afternoon session on the first day. The morning session starts at 10 sharp, the afternoon sessions starts at 1:30.