Syllabus for Introduction to Quantitative Methods (Math Camp)

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Class Website: http://homepage.ntu.edu.tw/~josephw/mathcamp_24S.htm

This is a flipped online course to help you go through the introduction of (undergraduate) real analysis, focusing on the first five chapter of Rudin's *Principles of Mathematical Analysis*. The purpose is to introduce economics students to point-set topology which forms the foundation of Advanced Calculus, so they can study abstract mathematics required for graduate studies in economics. Students are expected to:

1. **Watch Lecture Videos Online**: Such as that of Francis Su (Harvey Mudd College) http://analysisyawp.blogspot.com/2013/01/lectures.html
2. **Self Quiz**: Take quizzes of 50 minutes each after learning the material, which solutions are available online. Try more Practice Questions and come to office hours if needed!

Textbook and Other Recommended Reading:

1. Rudin, *Principles of Mathematical Analysis*, 3rd ed., McGraw Hill. (Textbook)
2. Ok, *Real Analysis with Economic Applications*, Princeton University Press. (Chap. A)
3. Tao, *Analysis I: Third Edition*, Springer. (e-book available through NTU library)
4. *Interactive Real Analysis*:

Grading: Final Exam (In-person) counts as 100% by appointment.

Course Outline:

1. Lecture 1-2: Constructing the Rational Numbers; Properties of Q
2. Lecture 3-4: Construction of R; The Least Upper Bound Property
3. Lecture 5-6: Complex Numbers; The Principle of Induction
4. Lecture 7-8: Countable/uncountable Set; Cantor Diagonalization, Metric Space
5. Lecture 9-10: Limit Points; Relationship between Open and Closed Sets
6. Lecture 11-12: Compact Sets; Relationship between Compact, Closed Sets
7. Lecture 13-14: Compactness, Heine-Borel Theorem; Connected Sets, Cantor Sets
8. Lecture 15-16: Convergence of Sequences; Subsequences, Cauchy Sequences
9. Lecture 17-18: Complete Spaces; Series
10. Lecture 19-20: Series Convergence Tests; Functions - Limits and Continuity
11. Lecture 21-22: Continuous Functions; Uniform Continuity
12. Lecture 23-24: Discontinuous Functions; The Derivative, Mean Value Theorem
13. Lecture 25: Taylor's Theorem; Sequences of Functions; Brouwer Fixed-Point Theorem
14. Lecture 26-27: Sequences of Functions; Brower's Fixed-Point Theorem (optional)
15. Final Exam