Math Camp for Microeconomics

Instructor: Castiel Chen Zhuang
September 18-20, 2018

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Office Hours: by appointment
Office: SAV 319B
Class Hours: 9am-12pm (T-Th), and 1-4pm (T&W)
Class Room: DEN 112

Course Description
The aim of this course is to introduce/remind you a basic level of mathematics which is required for the first-year graduate-level courses in microeconomics. As you will soon learn topics such as consumer theory, the theory of competitive firm, decision making under risk, uncertainty, and general equilibrium, and so on, we need to refresh you with topology, real analysis, optimization, and linear algebra. Due to the short amount of time, there will not be homework or an exam, but practice questions (with solutions) will be provided for your reference.

Course Materials
There is no required text for this course. Nevertheless, I will try to prepare handouts (but only in hard copy) for you before each session. Please also get ready to take notes from the whiteboard in case that I cover any additional materials and/or the handouts do not come in time. Although it’s not required, I would strongly recommend you to read the mathematical appendix of Mas-Colell, Winston and Green (1995): Microeconomic Theory, as it contains a condensed overview of mathematical tools which are used in microeconomic theory.

Schedule and Learning Goals
The schedule is tentative and thus subject to change. The learning goals below should be viewed as the key concepts you should grasp after each session, and also as a study guide before doing practice questions, and at the end of the week. I probably list more topics than what I can cover within 3*5 hours, but they are all very important. If there are any topics below that are not covered in class, you should try to learn/review them by yourself after class - all topics listed here will be included in the handouts.
## Tentative Course Outline

<table>
<thead>
<tr>
<th>Session</th>
<th>Time</th>
<th>Learning Goals</th>
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<tbody>
<tr>
<td>1</td>
<td>Sep 18, 9am-12pm</td>
<td><strong>Topology:</strong>&lt;br&gt;• Metrics, open sets, and sequences&lt;br&gt;• Compactness, and other properties of topological spaces</td>
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<td>2</td>
<td>Sep 18, 1pm-4pm</td>
<td><strong>Topology (continued):</strong>&lt;br&gt;• Mappings, correspondences, and (hemi-) continuity&lt;br&gt;• Fixed points, and min-max theorem&lt;br&gt;<strong>Linear algebra:</strong>&lt;br&gt;• Systems of equation, and elementary operations</td>
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<td>3</td>
<td>Sep 19, 9am-12pm</td>
<td><strong>Linear algebra (continued):</strong>&lt;br&gt;• Determinant, and other basic concepts&lt;br&gt;• Eigenvalues, eigenvectors, and Jordan theorem</td>
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<tr>
<td>4</td>
<td>Sep 19, 1pm-4pm</td>
<td><strong>Real analysis:</strong>&lt;br&gt;• Differentiation, and basics of integration&lt;br&gt;<strong>Optimization:</strong>&lt;br&gt;• Unconstraint and equality-constrained optimization</td>
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<td>5</td>
<td>Sep 20, 9am-12pm</td>
<td><strong>Optimization (continued):</strong>&lt;br&gt;• Inequality-constrained optimization&lt;br&gt;• Convexity, and some basic concepts and results in convex analysis</td>
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## Confidentiality Notice

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