14.00 -Summer Math Camp

Department of Economics, MIT

August 13-31, 2007

Instructor: Ufuk Akcigit, Office: E52-243D, E-mail: uakcigit@mit.edu.

Time and Location: M,W,F, 9:00 - 12:30, TBA.

Description of the Course: This course is a review of the basic mathematical tools used in the core sequence of the 1st year graduate program in Economics at MIT.

Grading: The participation to the Math Camp is totally voluntary and the participants will not receive any grade.

Exams: There will be no exam for the Math Camp. In order to give you the chance to test yourself on the materials covered in lectures, you will receive several problem sets as we progress.

Tentative Course Outline[1][2]
Week #1

- Proofs and logical arguments

- Set Theory

  - Functions, relations...

- Analysis

  - Topology of the Real numbers, closed/open sets, convergence, compactness, metric spaces, sequences, continuity. Correspondences, upper hemi-continuity, lower hemi-continuity, fixed point theorems.

Week #2

- Functions of Several Variables

  - Convexity, differentiation, approximation by differentials, Mean value/ Inverse/ Implicit Function theorems.

- Statistics

  - Combinatorial probability, Bayes' rule, random variables, univaried/multivaried distributions, independence, covariance, correlations, types of convergence, Chebyshev's inequality, law of large numbers, Central limit theorems.

Week #3

- Linear Algebra

  - Linear mappings and matrices, basis, linear independence, rank, subspaces and dimensions, determinant, eigenvalues, definiteness, conditions of non-singularity, orthogonality and projection matrices.

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[1]These are some bullet points with a subset of the topics to give you some idea about the roadmap the course. The content and the order of the topics may change before the Math Camp starts.

[2]Some of the standard textbooks in Mathematical Economics and Statistics: Carl P. Simon and Lawrence Blume, **Mathematics for Economists**, Norton 1994. Alpha C. Chiang, **Fundamental Methods of Mathematical Economics**, McGraw Hill, 1983. Casella and Berger, **Statistical Inference**, Thomson Learning. Walter Rudin, **Principles of Mathematical Analysis**, McGraw Hill. An overview of the material: A. MasCollel, M.D. Whinston, and J.R. Green, **Microeconomic Theory** (math appendix).

- Uncontrained Optimization

- Constrained Optimization

    - Lagrange Method
    - Kuhn-Tucker Theorem