

**International School of Economics at Tbilisi State
University**

**Syllabus for "Mathematics for Economists" 2009/2010
year**

III Term. Calculus of Several Variables

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Reading

1. C. P. Simon, L. Blume. "Mathematics for Economists". W.W. Norton. 1994.
2. A.C. Chiang, K. Wainwright. "Fundamental Methods of Mathematical Economics". McGraw-Hill. 2005
3. Lecture Notes.

Grades: midterm - 40%, homework - 10%, final exam - 50%.

Week 1. Sets and Maps

Sets, operations on sets: union, intersection, direct product.

Sequences, limit, convergence, accumulation points, properties of limits.

Open sets, closed sets, compact sets.

Functions $R^n \rightarrow R$, $R^n \rightarrow R^m$. Geometrical representation of functions: graphs, level sets, images. Special kinds of functions: linear, quadratic, polynomials, continuous.

General notions: map, domain, range, image, kernel, composition, injection, surjection, bijection.

Week 2. Euclidian spaces

Metric and norm.

Orderings, preference relations, utility function.

Week 3. Quadratic Forms

Quadratic forms, definiteness. Linear constraints, bordered matrices.

Week 4. Multivariable Calculus I

Partial derivatives. Total derivative. Linear approximation. Economical applications.

Week 5. Multivariable Calculus II

Chain rule. Directional derivatives. Gradient.

Functions $R^n \rightarrow R^m$. Jacobian.

Linear approximation. Chain rule. Higher order derivatives. Hessian. Taylor polynomials.

Week 6. Implicit Functions

Implicit functions. Implicit function theorem. Several exogenous variables. Level sets. Systems of implicit functions.

Inverse function theorem. Rank theorem.

Week 7. Unconstrained Optimization

Local and global extrema. First order conditions. Second order conditions. Global maxima and minima. Regression analysis.

Economical applications.