Math Intensive Course
International Doctorate in Economic Analysis (IDEA)
Universitat Autónoma de Barcelona
SEPTEMBER 4-8TH, 2006

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Diagnostic Test: Monday, September 4th, 11:00-13:00, Seminar Room.

Time and Location: Sept. 4th, 15:00-17:00, and Sept. 5-8th, 11:00-14:15, Lecture Room C.

References:

- de la Fuente, Angel (2000), "*Mathematical Methods and Models for Economists*", Cambridge University Press.
- Simon, Carl P. and Lawrence Blume (1994), "*Mathematics for Economists*", New York: W.W.Norton and Company Inc.
- Rudin, Walter (1976), "*Principles of Mathematical Analysis",* New York: McGraw-Hill.
- Munkres, James R. (1975), "*Topology. A First Course*", Englewood Cliffs, New Jersey: Prentice-Hall.
- Greene, William H. (2000), "*Econometric Analysis*", Upper Saddle River, New Jersey: Prentice-Hall. (Chapter 2: *Matrix Algebra*).

Topics to be covered:

- *(Preliminaries)* Elements of Set Theory; De Morgan Laws; Functions; Restrictions of functions; Image and preimage of a set; Injective, surjective, and bijective functions; Inverse function.
- *(Euclidian Space)* Euclidian Norm and Metric; Open and Closed Sets; Compactness; Heine-Borel Theorem.
- *(Limits and Continuity)* Limit of a function $f : D \subset \mathbb{R}^n \to \mathbb{R}^m$: definition and properties; L'Hôpital rule; Directional limits; Continuity of a function $f : D \subset \mathbb{R}^n \to \mathbb{R}^m$: various definitions and properties; Composite function theorem.
- *(Differentiability)* Motivation: a "good" approximation by an affine function; Directional derivatives; Partial derivatives; Differentiability of a function $f : D \subset \mathbb{R}^n \to \mathbb{R}^m$: definition and properties; Differentiability and continuity; C^n class of functions, The Chain Rule; Higher order derivatives; Schwarz theorem.
- *(Convex sets and Concave functions)* Definition and characterizations; Properties of concave (convex) functions: Contour sets, Transformations; Concavity (convexity) of C^2 functions: definiteness of quadratic forms.
- *(Eigenvalues and Eigenvectors)* Motivation and examples: power of a matrix, linear systems of difference equations; Some properties; Real distinct eigenvalues: diagonalization of matrices; Real repeated eigenvalues: generalized eigenvectors, Jordan canonical form, solving nondiagonalizable difference equations; A note on the symmetric matrices.