SYLLABUS OF MATHEMATICS FOR ECONOMICS I
UNIVERSIDAD CARLOS III DE MADRID
Department of Economics.
First Year of the following bachelors:
Business Administration and double degrees with Business Administration, Finance & Accounting, Management & Technology.

Introduction.

The real numbers. Inequalities, intervals and absolute value.

Order relations: the orden of the real line and the Pareto order. Total and partial order. Maximun and minimun in a total order. Maximal and minimal points, maximun and minimun, in a partial order. The order completeness of $\mathbb{R}$.

Functions. Fundamental concepts: domain, range and graph. Operations on functions. Monotonic functions. Inverse function. Simmetry and periodicity.

Continuity.

Limit of a function at a point. Operations with limits: the squeeze theorem. Continous functions. Piecewise functions: one-sided limits.

Infinite limits: vertical asymptotes. Limits at infinite: horizontal and oblique asymptotes. Global continuity: definition. Bolzano's theorem (or zeroes theorem) and Darboux' theorem (or intermediate value theorem). Intersection of graphs and fixed points. Local and global extrema. Weierstrass' theorem. Aplications to Economy: existence and unicity of market equilibium.

Derivation I.

The tangent line problem and the rate of change problem. Derivable functions. Relationship between derivability and continuity. Calculus of derivatives. Chain rule and inverse functions. Piecewise functions. Implicit derivation. First order approximation.

Behaviour of the derivative in the local extrema. Aplication to the calculus of local and global extrema. Rolle's theorem and the intermediate value theorem.

Intervals of increase and decrease. Aplication to the calculus of local and global extrema.

L'Hôpital's rule. Calculus of indeterminate limits.

Derivation II.

Higher-order derivatives. Taylor's theorem. Aplication to the calculus of local extrema.

Concavity, convexity and inflection points. Geometric interpretation and characterization using derivatives. Aplication to the calculus of global extrema.

Applications to Economy: income, cost and marginal profit. Firm's behaviour: a) profit maximization; b) mean cost minimization.

Integration.

Calculation of primitives. Elementary primitives. Integration by parts, change of variable. Integration of trigonometric, rational and circular functions.

Definite integral concept: properties. Derivation and integration. Derivative of an integral function. Fundamental theorem of calculus: Barrow's rule.

Area and integral. Calculus ot the area of a bounded region. Integration of periodic, symmetric and inverse functions. Aproximated calculus of the area of a region limited by concave and/or convex functions. Aplications to Economy: definition of integral mean value.

Bibliography:

Basic bibliography:

1. R. LARSON y B. H. EDWARDS. Cálculo 1. Ed.: McGraw Hill.

2. J. STEWART. Cálculo de una variable (Volumen I). Ed.:Thomson-Paraninfo

Recommended bibliography:

K. SYDSAETER, P. J. HAMMOND y A. CARVAJAL. Matemáticas para el análisis económico. Ed.: Prentice Hall.

V. TOMEO, I. UÑA y J. SAN MARTÍN: Problemas Resueltos de Cálculo de Una Variable. Ed.:Thompson-Paraninfo.

P. SANZ y F. J. VAZQUEZ. Cuestiones de Cálculo. Ed. Pirámide.

A. CHIANG. Métodos fundamentales de Economía Matemática. Ed. McGraw Hill.

Assessment system:

Basic Criterion:

Final exam common to all groups.

This exam will be graded by the teacher of the small group.

The weight of the final exam grade on the final grade will be of 60%.

Complementary criterion:

Class grade obtained by the teachers of the reduced and magistral group.

This grade will be obtained during the semester, by exercises resolution during the lectures.

The weight of the class grade on the final grade will be of 40%.

Subject's web page: `http://www.eco.uc3m.es/docencia/matematicasi/`