

SYLLABUS OF MATHEMATICS FOR ECONOMICS I
UNIVERSIDAD CARLOS III DE MADRID
Department of Economics. First Year of the following bachelors:
Economy, Business Administration

Introduction.

The real numbers. Inequalities, intervals and absolute value.

Order relations: the order of the real line and the Pareto order. Total and partial order. Maximum and minimum in a total order. Maximal and minimal points, maximum and minimum, in a partial order. The order completeness of \mathbb{R} .

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

Continuity.

Limit of a function at a point. Operations with limits: the squeeze theorem. Continuous 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. Applications to Economy: existence and unicity of market equilibrium.

Derivation I.

The tangent line problem and the rate of change problem. Differentiable functions. Relationship between differentiability and continuity. Calculus of derivatives. Chain rule and inverse functions. Piecewise functions. Implicit differentiation.

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

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

Derivation II.

L'Hôpital's rule. Calculus of indeterminate limits. Higher-order derivatives. Taylor's theorem. Application to the calculus of local extrema.

Concavity, convexity and inflection points. Geometric interpretation and characterization using derivatives. Application 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 of the area of a bounded region. Integration of periodic, symmetric and inverse functions. Approximated calculus of the area of a region limited by concave and/or convex functions. Applications to Economy: definition of integral mean value. Improper integrals.

Bibliography:

Basic bibliography:

1. R. E. LARSON, R. P. HOSTETLER y B. H. EDWARDS. Cálculo y Geometría Analítica (Volumen I). Ed.: McGraw Hill.

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

Recommended bibliography:

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

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

J. GRAFE. Matemáticas para Economistas. Ed: McGraw Hill.

M. LÓPEZ CACHERO y A. VEGAS PÉREZ. Curso básico de Matemáticas para la Economía y Dirección de Empresas. Ed: Pirámide.

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

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

E.T. DOWLING. Cálculo para Administración, Economía y Ciencias Sociales. Ed.: McGraw Hill.

A. GARCÍA, F. GARCÍA. Cálculo I. Teoría y Problemas de Análisis Matemático.

Assessment system:

Basic Criterion:

Final exam common to all groups.

This exam will be graded by the teacher of the small group in conjunction with the teacher of the corresponding big group.

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

Complementary criterion:

Class grade obtained by the teacher of the small group, under the supervision of the teacher of the corresponding big 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 a 40%.

Subject's web page: <http://www.eco.uc3m.es/docencia/maticasi/>