

Anna Attias

Matematica Corso Base - 9 cfu

OBJECTIVES

This is a basic course in Mathematics included in all the three-year Bachelor Programs of the Faculty of Economics. This course provides the prerequisites and basic mathematical tools needed for the next courses in the Program, and it is accessible to students with different mathematical background. Some of the two-year Master Degree Programs require additional mathematical competences. At this aim, students may follow other courses offered by our Department. In particular for the students interested in quantitative approach in finance and insurance, the Faculty offers the two-year Master Degree Program in Finance and Insurance (FINASS) in which advanced mathematical courses are provided.

Course's objectives for students

To learn the basics of mathematics needed for other courses requiring a mathematical background (such as Economics and Statistics).

PROGRAM

PREREQUISITES: basic algebra - equations and inequations - exponentiation with real exponent - logarithms - analytic geometry - basic goniometry - set theory essentials.

LINEAR ALGEBRA: Vectors - Algebra with vectors - Linear combination of vectors - Convex linear combination of vectors - Linear spaces and subspaces - Linear dependence and independence and related theorems - Rank of a vector set - Theorem of unique representation - Fundamental theorem of linear spaces - Matrices - Algebra with matrices - Determinants - Evaluation of determinants - Sarrus's rule - First Laplace's theorem - Minors of a matrix - Rank of a matrix - Properties of determinants - Systems of linear equations - Solution of a system of linear equations - Rouché-Capelli's theorem - Cramer's theorem - Homogeneous systems of linear equations - Parametric systems of linear equations.

NUMERATION SYSTEMS AND NUMERICAL SETS: Induction-proof method - Indirect proof (argument's sake) - Sets of real numbers - Sets majorants and

minorants - Maxima and minima, upper and lower bounds - Distance - Neighborhood of a point - Accumulation point.

REAL VALUED FUNCTION OF ONE REAL VARIABLE: Elementary functions - Graphic representation - Monotonicity - Inverse function - Functions composition - Limit of a function - Finite limit and finite limit-point case - Generalization of the definition and other limit cases - Right and left limits - Theorems on limits of functions: uniqueness, sign-persistence (direct and inverse), comparison - Operations with limits - Operations with infinity symbols - Continuous functions - Continuity on the right and left hand side - Continuity on an interval - Singular points - Theorems on continuous functions: sign-persistence, of the maximum and the minimum (Weierstrass's theorem), of existence of zeros, of fixed point - Composition of functions and inverse function - Infinitesimals and infinites - Notable limits.

SEQUENCES: Definitions - Limit of a sequence (all cases) - Theorems on limits of sequences: uniqueness, sign-persistence (direct and inverse), comparison theorem - Theorems on monotone sequences - Operations with limits of sequences.

SERIES: General definitions - Sequence of the partial sums of a series - Convergent, divergent, indeterminate series - Geometric and Harmonic series.

DIFFERENTIAL CALCULUS: Definition of derivative - Relationship between differentiation and continuity - Geometric interpretation of derivatives - Derivative rules and related theorems - Derivative of power, exponential and logarithmic functions - Locally increasing/decreasing functions and related theorems - Mean value theorem: Rolle, Cauchy, Lagrange - Globally increasing/decreasing functions and related theorems - Indeterminate forms - de l'Hôpital's theorem - Differential of a function - Derivative of the composition of functions - Second derivative and higher order derivatives - Locally concave/convex functions - Inflection points and related theorems - Concave/convex functions in an interval and related theorems - Taylor's formula - Lagrange form of the remainder in Taylor's formula - Derivative methods for the study of stationary and inflection points and related theorems - Asymptotes - Graphical representation of a function.

INTEGRAL CALCULUS: Integral sums, definition of integral and associated theorems - Integrals as an area - Properties of the integral - The mean value theorem for integrals - Definite integral and related theorems - Integral function - Fundamental theorem of integral calculus - Use of the primitive function for the evaluation of the definite integral - Indefinite integral - Indefinite integration methods: by decomposition, by substitution and by parts - Rules for evaluation of definite

integrals - Definite integration methods: integration by decomposition, by substitution and by parts.

FUNCTION OF TWO AND MORE REAL VARIABLE: A BRIEF OUTLINE.

TESTI ADOTTATI

- M. Angrisani, Introduzione alla attività matematica, CISU Edizioni, Roma, 2011;
- A. Attias - P. Ferroni, Introduzione alla attività matematica. 700 esercizi svolti, CISU Edizioni, Roma, 2012;
- S. Bianchi, Appunti di Algebra lineare (<http://mat.eco.unicas.it>).

DELIVERY MODE

Traditional

FREQUENCY

Optional

VALUATION

Prova orale