UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Istituzioni di Matematica I

2324-1-E3002Q001

Aims

The student must acquire basic concepts and results of mathematical analysis in one real variable.

Contents

Numerical sets: natural, integer, rational, real and complex numbers. Functions of one real variable, limits, continuity, differentiability. Derivative of a function. Riemann integral and improper integral. Elementary notions of ordinary differential equations.

Detailed program

1. Natural numbers, integer numbers, rational numbers, real numbers. Complex numbers: cartesian and polar forms, De Moivre formula, roots of a complex number.

2. Real valued functions of one real variable. Domain, codomain, and image of a function. Injectivity, surjectivity, inverse of a function. Increasing and decreasing functions. Graph and main properties of elementary functions.

3. Limit of a function at a point. Computation of limits. Continuity; points of discontinuity.

4. Derivative of a function at a point, geometrical and physical intepretations. Tangent line. Differentiation rules. Non-differentiable points.

5. Maxima and minima of a function. Weierstrass theorem, Fermat theorem, Lagrange theorem, de l'Hospital rule. Convexity and inflection points.

6. Primitives of a function. Area of plane figures and the Riemann integral. Computation of definite integrals. Fundamental theorem of calculus. Integration by parts and by substitution. Improper integrals.

7. Ordinary differential equations. General solution and Cauchy problem. Linear equations of the first order. Method of separation of variables. Second order linear equations with constant coefficients.

Prerequisites

Elementary algebra, geometry, and trigonometry, as covered in high school classes or in this University's preliminary courses.

Teaching form

Lectures (40h - 5 CFU), exercises sessions (36h - 3 CFU). Live lectures and exercise sessions will be held in Italian. Further references, such as some texts or the narration of some videos could be in English.

Textbook and teaching resource

Reference textbooks:

• J. Stewart, Calcolo. Funzioni di una variabile, Apogeo.

Further references:

• M. Conti, D.L. Ferrario, S. Terracini, G. Verzini. Analisi Matematica VOL. 1. Apogeo.

Semester

First semester, October - January

Assessment method

The exam consists in a written part - in which students are required to solve some exercises - and an oral part. In order to take the oral exam, students must have been admitted, following the written exam in the same session. The written exam includes multiple-choice questions, and at least one open question, through Esamionline's platform. The oral examination is mandatory for students
who have been admitted but their written exam has been considered insufficient. For them, the oral exam consists in a question, possibly comprising few parts, concerning basic results covered in the course. The allowed time is 20 minutes. A discussion of the given answer will follow. The oral exam is discretionary for students having received a passing grade in the written examination. For them, the oral exam may cover any part of the

course.

Under special circumstances and by a student's request, the oral examination may be held in english.

Office hours

By appointment: simone.borghesi@unimib.it

Sustainable Development Goals