UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

# COURSE SYLLABUS

# Calculus I

**2021-1-E4101B001**

## Learning objectives

## Contents

The contents of the course can be schematically arranged in three intertwined parts:

1) asymptotic estimates (limits of functions);

2) differential calculus (first order derivative and beyond) and its applications;

3) Riemann integrability of functions and integral calculus.

## Detailed program

Sets and functions and related terminology. Some cardinal numerals.

A peculiar set: the real number set; its fundamental metric and arithmetic properties. Upper bound of a subset of the real number set.

Scalar functions and sequences: the notion of limit and its properties; monotonicity and symmetry; the property of continuity and its relationship with the limit; infinitesimal and asymptotic behaviour.

Differential calculus for real univariate functions: first derivative, its basic properties and differentiation rules; second and further derivatives; their use in asymptotic estimates and in drawing a function graph; Taylor's formula.

Series: behaviours and convergence criteria. Main Mc Laurin's series (sin, cos, exp and log).

Integral: definite integral and anti-derivative (indefinite integral), main properties and calculation techniques.

Generalized integral: integrability criteria in the case of unbounded functions and/or in the case of unbounded integration domains.

## Prerequisites

No prerequisite. A refreshement, guided in case by a tutor, is advised, which should concern the main topics typically taught at the high school.

## Teaching methods

Class lectures.

During the teaching period, some exercise sessions are organized.

## Assessment methods

## Textbooks and Reading Materials

M. Bramanti, C.D. Pagani, S. Salsa, Analisi Matematica 1, Zanichelli, Bologna, 2008

S. Salsa, A. Squellati, Esercizi di Analisi matematica 1, Zanichelli, Bologna, 2011

A. Guerraggio, Matematica, Pearson, 2014.

Some additional material, in particular anthologies of exercises and exam simulations, are provided in e-learning.

## Semester

First semester

## Teaching language

Italian