

**20283 Analisi Matematica 1 + Geometria 1**  
(Calculus 1 + Geometry 1)

**Scientific area:** Mat/05-03

**Credits:** 13

**Objectives**

The course provides the basic tools of differential calculus of functions of one real variable. Vectors in Euclidean space and matrices will also be introduced, focusing on the solution of linear systems and on analytic geometry. One of the main objectives is to develop fundamental mathematical skills while keeping an eye on rigour and methodology.

**Program**

Real numbers and the oriented line. The Cartesian plane, graphs of elementary functions of one real variable. Operations on functions and graphical interpretation. Sequences of real numbers and their limits. Least upper bound, greatest lower bound. Monotonicity, composition and invertibility of functions. Powers, exponentials and logarithms. Limits of functions, infinitesimal and infinite functions at a point. Continuity. Linearization and derivatives. Convexity. Taylor expansions and applications to the study of critical points. Zeroes of functions. Polynomials. Complex numbers. Linear Systems. Matrices and determinants. Geometric vectors. Planar analytic geometry. Eigenvalues, eigenvectors and diagonalization.

**Skills**

The student is expected to be able to compute limits and derivatives, to graph a given function and to write the polynomial approximation of a regular function, to solve a linear system in several unknowns, to diagonalize a matrix and to solve problems of analytic geometry.

**Organization**

The course features theoretical lectures (72 hours) and problem sessions (48 hours).

**Examination**

The final exam consists of a written test and an oral examination. During the course there might also be intermediate written tests.

**Bibliography**

Lecture notes by F. De Mari: <http://www.dima.unige.it/~demari/DIDA.html>  
M. Catalisano e A. Perelli, *Appunti di geometria e calcolo numerico*.