



Dipartimento di Scienze e Tecnologie

ANNO ACCADEMICO 2017/2018

CORSO di STUDIO in Scienze Geologiche
INSEGNAMENTO in Fundamentals of Mathematics

DOCENTE Prof.ssa Perugia Carmen

- **Some hints about sets theory and analytical geometry**
- **Real functions of one variable.**

Domain, codomain and image of a function. Maximum, minimum, upper and lower bounds. Monotone, composite, inverse functions. Definition of limit of a function, limits on the left and on the right. Theorems about limits (proof). Calculation rules about limits. Proof of the limit of $\sin x / x$ when x tends to zero. Infinite and infinitesimal functions. Continuous functions. Points of discontinuity and their classification. Horizontal, vertical and oblique asymptotes. Theorems about continuous functions. Definition of derivative of a function of a real variable and its geometric meaning. Tangent line equation at a curve at a point. Derivateness and continuity (dim.). Deriving rules. Fermat (dim.), Rolle (dim.) and Lagrange theorems with its corollaries: monotonicity criterium, characterization of constant functions. Differentiability of a function of one variable. High order derivatives. De l' Hôpital theorem. About Taylor's formula. Concavity, convexity, flames and asymptotes. Graphing a Function Graph.

- **Differential calculation in more than one dimension.** Gradient and directional derivative. High order derivatives. Rotor and divergence.
- **Riemann integral.** Definition and properties. The mean value theorem (dim.). Primitive of a function: definition and characterization (dim.). The fundamental theorem of integral calculus (dim.). The basic formula of integral calculus. Integration rules and methods. Use of integrals for the calculation of areas.

Textbook

P. Marcellini - C. Sbordone, Elementi di Analisi Matematica Uno, Liguori ed.

Other books

C. Sbordone - F. Sbordone, Matematica per le Scienze della Vita, EdiSES.

M. Bramanti - C. D. Pagani - S. Salsa, Analisi matematica 1, Zanichelli.

D. Benedetto - M. Degli Esposti - C. Maffei, Matematica per le scienze della vita, Casa Editrice Ambrosiana (nuova edizione).

Books with a wide set of exercises:

S. Salsa - A. Squillati, Esercizi di Matematica vol.1, Zanichelli ed.

P. Marcellini - C. Sbordone, Esercizi di Matematica vol.1 (parte I e II), Liguori ed.

A. Alvino - L. Carbone - G. Trombetti, Esercitazioni di Matematica vol. 1 (parte I e II), Liguori ed.