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## Geometry B

### Finalità

We will study the main tools in Linear Algebra (vector spaces, linear maps, bilinear forms, scalar products, and their connections with matrices), referring also to Algebra (Group theory) and Geometry (Quadric surfaces).

### Programma

Linear maps and matrices in the euclidean plane: projections, reflections, rotations, isometries.

Group theory: definitions, examples, subgroups, isomorphisms, homomorphisms, examples.

Real and complex vector spaces: definitions, subspaces, bases.

Linear maps: definitions and examples, kernel and image, the dimension's formula. Linear maps from  $K^{\sup>n\sup>}$  to  $K^{\sup>m\sup>}$  and matrices.

Basis change and matrices. Matrices of linear maps on finite dimensional vector spaces.

Invariant subspaces, eigenvalues, eigenvectors and their properties. Diagonalization of real and complex operators.

Orthogonal matrices and operators. Systems of ordinary differential equations with constant coefficients.

Bilinear forms and scalar products. Spectral theorem and its corollaries. Diagonalization of symmetric matrices using orthogonal matrices.

Something about the classification of quadric surfaces in the space and of conics in the plane.

### Attività d'esercitazione

Exercises about the arguments in the program.

### Modalità d'esame

Test and possible discussion. The test can be divided in two parts.

### Propedeuticità

Geometria A

### Testi consigliati

M. ARTIN, Algebra, ed. Bollati Boringhieri (1997)

W. KEITH NICHOLSON, Algebra lineare, McGraw-Hill (2002).