

LINEAR ALGEBRA II FOR PHYSICS

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FS 2021

PROGRAM

- (1) Linear ODEs and Diagonalization of Endomorphisms.
 - (a) Differential equations: linear ODEs with constant coefficients; systems of linear ODEs with constant coefficients; the matrix exponential and its evaluation.
 - (b) Diagonalization of matrices.
 - (c) Diagonalization of endomorphisms. In particular: the spectral decomposition; the infinite-dimensional case.
 - (d) Trigonalization.
- (2) Inner Products.
 - (a) The dot product.
 - (b) Inner product spaces.
 - (c) The norm.
 - (d) Square-integrable continuous functions and square-summable sequences.
 - (e) Orthogonality: the orthogonal projection; the Gram–Schmidt process; orthogonal complements.
 - (f) Orthogonal operators: isometries; the orthogonal groups; symmetric and skew-symmetric operators.
- (3) Hermitian products.
 - (a) The standard hermitian product on \mathbb{C}^n .
 - (b) Hermitian spaces. In particular: nondegeneracy and Dirac’s notation; the adjoint of an operator.
 - (c) The norm.
 - (d) Orthogonality: the orthogonal projection; the Gram–Schmidt process; orthogonal complements.
 - (e) Unitary operators: the unitary groups; self-adjoint and anti-self-adjoint operators.
 - (f) Diagonalization and normal form for some important classes of matrices: normal matrices and normal operators; diagonalization of unitary matrices; diagonalization of self-adjoint matrices; normal form of orthogonal matrices; diagonalization of real symmetric matrices and of real symmetric bilinear forms.

REFERENCES

- [1] ALBERTO S. CATTANEO, *Linear Algebra II for Physics*,
<http://user.math.uzh.ch/cattaneo/LAIIPhy.pdf>