

MATH 4373/5373 Abstract Linear Algebra – Chapters I–IV

Chapter I: (Vector Spaces)

- Fields (groups, rings), examples
- Vector spaces, examples
- Subspaces, examples
- Linear independence, generating sets, bases, dimension
- Coordinates with respect to a basis

Chapter II: (Linear Operators–I)

- Linear transformations, examples and intuitive properties
- Linear isomorphism of n -dimensional vector space with K^n
- Examples of linear transformations; matrices,...
- Image, kernel, rank, nullity
- Rank + nullity = dim(domain)
- $L(U, V)$ and $K^{m \times n}$
- Change of bases: coordinates
- Change of bases: linear transformations, Einstein summation convention

Chapter III: (Linear functionals and duality)

- Linear functionals, the dual space V^*
- Annihilators, hypersurfaces
- Systems of homogenous equations
- Dual of dual
- Adjoint operator, transpose
- Rank, row rank, column rank

Chapter IV: (Determinants)

- Several definitions of determinants (inductive, permutation)
- Properties of determinants
- Geometric interpretation