

Linear Algebra Preliminary Exam Syllabus (September 2022)

Disclaimer: *The topics listed below are intended to provide a guideline to the student preparing for the preliminary examination in Linear Algebra. It is by no means exhaustive.*

Preliminaries – elementary linear algebra of Euclidean space and matrices. Basic ideas from sets, functions, fields, complex numbers and polynomials

Vector Spaces – axioms, subspaces, linear independence, bases and dimension.

Linear Transformations – linearity, null space, range, matrix representation of a linear transformation, composition of linear transformation, one-to-one and onto maps, invertibility and isomorphism, change of bases, similarity.

Diagonalization -- determinants, eigenvalue and eigenvector, characteristic polynomial, diagonalizability, invariant subspaces, Caley-Hamilton theorem.

Inner product spaces – inner products, norms, orthogonal projections, Gram-Schmidt orthogonalization, adjoint of a linear transformations, normal and self-adjoint transformations, unitary and orthogonal transformations and their matrices.

Canonical forms – generalized eigenvectors, Jordan canonical form, similarity, minimal polynomial.

Suggested References

1. *Linear Algebra*: S. Friedberg, A. Insel and L. Spence
2. *Linear Algebra*: K. Hoffman and R. Kunze
3. *Linear Algebra done right*: S. Axler
4. *Matrix Analysis*: R. Horn and C. Johnson
5. *Linear algebra and its Applications*: G. Strang
6. *Elementary Linear Algebra*: H. Anton and C. Rorres