LINEAR ALGEBRA LIST OF TOPICS AND HOMEWORKS

The references are to "Linear Algebra" by Hoffman/Kunze. (There are a few topics which are not covered in the book.)

- Introduction
- Fields, vector spaces (1.1, 2.1, 2.2 up to Theorem 1)
- Subspaces, intersection and sum, direct sum (2.2, 6.6)
- HW 1 - Section 1.2 problems 5, 7 and 8, section 2.1 problems 1,3,7, section 2.2 problems 7,9
- Direct sum and complement, linear independence (2.3)
- Basis, exchange lemma (2.3)
- HW 2 - Section 2.3 problems 4,7,8,9,10, section 6.6 problems 1,2
- Exchange theorem, the dimension of a vector space, dimension formula (2.3)
- Matrices, systems of linear equations, Row-reduced echelon form, elementary row operations (1.4, 1.5)
- elementary matrices, invertible matrices (1.5, 1.6)
- Linear maps, the isomorphism theorem (part of 3.1, 3.3)
- dimension formula for linear maps (Theorem 2 in 3.1), coordinates (2.4)
- HW 4 - Section 2.4 problems 5,6,7, section 3.2 problem 6, section 3.3 problem 7
- Matrix representations of linear maps (3.4), more on matrix representations of linear maps (3.4 Theorem 13), equivalence and similarity (3.4)
- rank (2.5), applications to systems of linear equations, congruence relations
- HW 5 - section 3.4 problems 2,9,10,12
- quotient spaces, homomorphism theorem (A.3, A.4, A.5) Ways to think about quotients
- Linear forms (3.5), duality (3.6), orthogonality (3.5)
- dual linear map (3.7)
- permutations (part of 5.3), multilinear forms, alternating multilinear forms
- alternating multilinear forms, determinant of an endomorphism(5.2, 5.3)
- HW 7 - section 5.2 problems 1,13, section 5.3 problems 3,4,9,12,13
- Determinants of matrices (5.4)
- Laplace Expansion, Cramer's rule (5.4), Polynomials (4.1, 4.2, 4.5)
- HW 8 - section 4.5 Problems 3,5,6, section 5.4 8,11
- Eigenvalues, characteristic polynomial (6.2)
- Minimal polynomial, primary decomposition (6.3, 6.4)
- HW 9 - section 6.2 Problem 5,7,14, section 6.3 Problem 6,9, section 6.4 Problem 1
- Generalized eigenspaces, Jordan normal form for nilpotent endomorphisms (7.3)
- Jordan normal form, Hermitian forms, inner products, orthonormalization (8.1, 8.2)
- HW 10 - section 7.3 Problem 1,2,3,8,9,11
- orthogonal complement, self-duality, adjoint maps, self-adjoint operators (8.2, 8.3)

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