21-240: Exam 2 Topics List

Definitions (this list is not necessarily complete! You should know all of the definitions in the sections we covered, these are the most important ones): Subspace, column space, null space, row space, basis, coordinates relative to a basis, dimension, rank, cofactor, determinant, vector space, subspace of a vector space, linearly independent sets and span and bases in vector spaces, linear difference equations (homogeneous and nonhomogeneous), probability vector, stochastic matrix, Markov chain, steady state vectors, eigenvalues and eigenvectors, eigenspace, characteristic polynomial, similar matrices, diagonal representation, diagonalizable

Topics:

- The invertible matrix theorem
- Showing a set is a subspace or not
- That the column space, row space, null space of a matrix are subspaces.
- Computing a column space
- Computing a null space
- Finding a basis for a subspace
- The pivot columns form a basis for the column space
- Computing coordinates relative to a given basis
- Computing the dimension of a subspace
- Computing the rank of a matrix
- The Rank-Nullity theorem
- The basis theorem
- The invertible matrix theorem
- Calculating the determinant of a matrix

- Properties of determinant under matrix multiplication, transpose, row operations, etc

- Cramer's rule

- Determinants as area and volume

- Determinants characterizing invertibility (THE INVERTIBLE MATRIX THEOREM)

- Vector space axioms, subspace of a vector space

- Linear independence, dimension, bases in vector spaces

- Difference equations

- Markov chains and steady state vectors

- Computing eigenvalues and eigenvectors of a matrix

- Computing the eigenspace for a given eigenvalue

- Calculating a characteristic equation and using it to compute eigenvalues

- Similar matrices have the same eigenvalues

- Diagonalization/diagonalizability

- Basis of eigenvectors