

Final Exam

Format & Topics

Exam Date/Time: Tuesday, Dec 10 at 8pm in Denny 109

Format: 3 parts (1 will be optional)

Part I: a theory quiz

Topics covered: chapters 1 – 5

Be sure to know the main definitions and theorems (ie: properties). A summary of these is listed below. No calculators will be allowed for this section, which will consist of T/F, multiple choice, matching, and short answer questions.

Know the following definitions:

- Echelon form vs Reduced Echelon form
- A system of linear equations vs a vector equation vs a matrix equation
- Coefficient matrix vs augmented matrix
- Parametric vector form
- Linear transformations
- Singular
- Vector space / subspace
- Nul A / Col A / Row A
- A basis / dimension
- Linear independence / linear dependence / spanning
- Eigenvector/Eigenvalue/Eigenspace
- The characteristic equation

Know how to:

- Find pivots of a matrix
- Determine whether a transformation is linear
- Do matrix operations (both on regular matrices & block matrices)
- Determine whether a matrix is the inverse of a given matrix / find the inverse of a matrix
- Spot an LU factorization / explain how to find an LU factorization
- Spot a diagonalization / explain how to find a diagonalization / use a diagonalization
- Determine if a set is a vector space
- Know the key vector spaces (ie: \mathbb{R}^n , \mathbb{P}_n , and \mathbb{P}), including their dimension
- Find the basis coordinates of a vector for a given vector space & basis
- Find a subspace of a vector space of a particular dimension
- Determine whether a given vector/scalar is an eigenvector/eigenvalue

Know the main properties (ie: important theorems)

- Properties of matrix operations (ie: things like $(AB)^{-1} = B^{-1}A^{-1}$)
- The main theorem of section 2.3 – with the extra properties
- Properties of determinants
- The Rank Theorem
- The relationship of the dimension of a subspace to the dimension of its vector space

Part II: a chapter 5 exam

Topics covered: sections 5.1 – 5.4

Know the following definitions:

- Eigenvector/Eigenvalue/Eigenspace
- Eigenvector basis (and when it exists)
- The characteristic equation/polynomial
- Similar Matrices
- Jordan-Normal Form (see last page of on-line notes for section 5.4)

Know how to:

- Determine whether a given vector/scalar is an eigenvector/eigenvalue
- Find the eigenvalues/eigenvectors/eigenspaces of a matrix
- Diagonalize a matrix
- The matrix of a linear transformation
- Using similarity to compute the \mathcal{B} -matrix
- Deal with dynamical systems and eigenvalues/eigenvectors

Know the main properties (ie: important theorems)

- The Invertible Matrix Theorem – with the extra properties from chapter 5
- The Diagonalization Theorem
- Diagonal Matrix Representation

Part III (optional): a cumulative final

Topics covered: chapters 1 – 4

This part will replace your lowest exam grade.

Know the key topics, definitions, theorems/properties, and methods.

For more information and sample questions, review the 3 in-class exams & their study guides.