Newberger Math 247 Spring 03

Review sheet for the Final Exam

Part I

This part of the final exam will be over material covered since the second midterm. It will cover Sections 4.1-4.4, 4.7, 5.1, 5.2.

- You **will** be asked to state the definitions of the following terms. Use precise language; to be safe, you may want to use the definitions straight from the text.
  1. The coordinates of a vector relative to a basis. (See p246.)
  2. Eigenvalue and eigenvector.

- Other vocabulary that you should be familiar with:
  1. Subspace of a vector space.
  2. Null space and column space of a matrix.
  3. Basis.
  4. The vector space $\mathbb{P}_n$.
  5. Change of coordinates matrix.
  6. Eigenspace.
  7. Characteristic equation.

- From Sections 4.1-4.4 and 4.7:
  1. You **will** be asked to determine whether or not a given set is a subspace of a vector space, and to show that your answer is correct. To show that a given set is not a subspace, you must either prove that the zero vector is not in the given set or give a *specific numeric example* for which one of the other properties of a subspace fails.
  2. You **will** be asked to do calculations relating to bases, coordinate matrices and change of coordinate matrices (see the Quiz over 4.4 and 4.7).
  3. You **will** be asked questions pertaining to $\mathbb{P}_n$, the vector space of polynomials of degree less than or equal to n. These may include determining whether or not a given set of polynomials is a subspace; determining if a given set of polynomials spans or is a basis for $\mathbb{P}_n$, or is linearly independent; finding coordinates for a given polynomial with respect to a given basis; or, finding a polynomial given its coordinates with respect to a given basis.

- From Sections 5.1 and 5.2:
  1. You **will** be asked to compute eigenvalues, eigenvectors and eigenspaces of a given matrix.
  2. You may be asked to explain properties of eigenvalues, eigenvectors and eigenspaces.

Part II

This part of the final exam will cover all material covered in this course. Please refer to the review sheets for Midterm Exams 1 and 2 for an overview of this material. The quizzes and past exams are excellent resources to help you prepare for this exam.

Here are some guarantees:

1. You will be asked about each of the five main divisions of material covered in this class:
   - **Systems of equations** (consistent, inconsistent, number of solutions, geometric descriptions of their solutions);
   - **Vectors** (linear combinations, linearly independent, span, bases, coordinates, change of coordinates);
   - **Matrices** (invertible, pivot positions, echelon form and reduced echelon form, determinants, eigenvalues, eigenvectors);
   - **Transformations** (linear, one-to-one, onto, range, domain, codomain, standard matrix); and
   - **Vector spaces and subspaces** (Null spaces, column spaces, eigenspaces, and their bases, geometric descriptions).
2. You **will** be asked short answer Explain Why questions.
3. You may be asked to give examples of systems, matrices, transformations or vectors with certain properties.
4. You **will** be asked to verify the properties of particular examples of matrices, vectors and/or transformations through calculations using row reduction and/or matrix multiplication.
5. You **will** be asked about geometric descriptions of sets of vectors.