Advice for the Final Exam

This exam is **cumulative**, so be sure to study the older chapters that were covered in previous exams. It is also essential that you look over your old exams to avoid repeating mistakes you may have made before. Make sure you understand how to solve all the problems that appeared in them.

You should definitely know the concepts covered in Sections 1.1, 1.2, 2.1, 2.5 and 2.7, although you will not be *directly* asked about these sections. Then you should focus on the following:

1.3: You should know how to find the general solution for a system of linear equations, and the conditions for getting a unique solution, infinitely many solutions, or no solutions.

1.4: This is the most important chapter for us. You need to know Gaussian elimination for most of the subsequent chapters, and you need to understand row echelon form and reduced row echelon form. You also need to know the rank-nullity theorem.

1.6: You should understand what the span of a set is, and you should know the theorems in this chapter well.

1.7: You should know what it means for a set of vectors to be linearly independent, and you should definitely know the information contained in Theorem 1.8, as well as the properties listed on p. 81.

2.3: You should understand elementary matrices, and how multiplication by an elementary matrix is equivalent to performing row operations. Make sure you can distinguish between an elementary matrix and the product of elementary matrices. You should also understand invertibility and how it is used to solve systems of linear equations.

2.4: You should know how to determine whether a matrix is invertible, and how to find the inverse if it is. You should pay attention to the Invertible Matrix Theorem.

3.1: You hsould know how to find the determinant of a matrix using a cofactor expansion.

3.2: You need to know all the properties of determinants listed in this section. You can ignore the section on Cramer's Rule.

4.1: You should know how to determine whether a given set is a subspace or not. Remember that all three conditions must hold for a set to be a subspace, but a single counterexample will show that it is not. Make sure you understand all the special subspaces associated to a matrix. You may use the fact that any set that can be written as a special subspace of a matrix is a subspace.

4.2: You need to understand what a basis is, and what the dimension of a subspace is. Pay special attention to the steps for showing that a given set is a basis for a subspace of $\mathcal{R}^n$.

4.3: You should know how to find a basis and the dimensions of the subspaces associated to a matrix. This is summarized in the table and blue box on p. 259, and it is vital you know all the information contained in them.

5.1: This is also an extremely important chapter! You must know how to find the eigenvalues and eigenvectors of a matrix, and a basis for the eigenspace corresponding to an eigenvalue.

5.2: You should know how to find the characteristic equation of a matrix, both directly from the matrix, and given information about eigenvalues and eigenvectors. You should know how to use the characteristic equation to determine eigenvalues and multiplicities.

5.3: This is another important chapter. We use diagonalizability in many of the later chapters, and it is important to know how to determine whether a matrix is diagonalizable, and how to find the diagonalization if it is.

6.1: You should know all the definitions and theorems in this chapter. You do not need to know the section on computing average class size.

6.2: You should know what an orthogonal/orthonormal set is, and how to write a vector as a linear combination of vectors in an orthogonal set using dot products. You definitely need to know the Gram-Schmidt process. We did not cover QR factorizations, and they will not be included in this exam.

6.3: You should know how to find the orthogonal complement of a set or subspace, and how to find the orthogonal projection onto a subspace. Make sure you know how to find a projection matrix!

6.4: You should know to find the least squares line for a set of data, and the error minimizing solution to an inconsistent system of linear equations. You can ignore the section of solutions of least norm.

6.5: You should know what orthogonal matrices are along with their properties. The section on rigid motions is not included.

6.6: You should know what symmetric matrices are, and how to find a spectral decomposition for them. Quadratic forms will not be included on this exam.

This is just a guideline, and may contain some omissions. It is just meant to highlight things that are really important. For each of these sections, make sure you know how to do all of the quiz problems and assigned homework problems! You might also want to look over examples worked out in the textbook and in class.