Math 54 Summer 2006

Final Practice/Outline

Answer without explanation = no credit.

The problems on the final are more or less standard problems. Nothing like the last two problems of the second midterm. So the best way to practice would be to make sure you can do problems from the book. You should also know how to do previous midterm problems. Here are some suggestions. You are strongly advised AGAINST doing all the problems mentioned here. Don't overwork yourself.

1. *Make sure you can solve systems of linear equations and can find inverses of matrices. Note that there is an easy formula for the* 2×2 *case. Problems 15-28 section 1.2. 25-34 section 1.4. Theorem 1.50 is important.*

2. *You should know how to find a basis and the dimension of a vector space described in various ways. 33-38 section 38 sec 3.6. Definitely make sure you understand the concepts of linear dependence/independence, span, subspace.*

3. *Let* V *and* W *be subspaces of* $\mathbb{R}^4$. *If* $V = Span\{(1,2,3,1),(-2,1,2,2)\}$ *and* $W = Span\{(-1,3,5,3),(1,1,1,1)\}$, *find a basis for the union* $V \cup W$.

4. *You should know what an inner product is and how to work with inner products. In particular how to use Gram-Schmidt. Problems 17-26 section 4.4*

5. *What are row space, column space, null space of a matrix? How do these change when you do row operations on a matrix? Relations between dimensions of these spaces. Problems like 42-44 section 3.7.*

6. *What is a linear transformation and how can you find a matrix that represents it? Notice that we did this in a more general setting than the book. In particular we chose different (non-standard) bases for the domain and range. Some problems are on page 251.*

7. *What are eigenvalues and eigenvectors. How to use them to diagonalize matrices. Necessary and sufficient conditions for a matrix to be diagonalizable. How to find powers and exponents of diagonalizable matrices. E.g. take a diagonalizable matrix and raise it to the power 2006 or calculate* e^A *for an* A.

8. *What is the characteristic polynomial? How are trance and determinant related to eigenvalues?*

9. *Which matrices can be orthogonally diagonalized? How can you do this? Problems 1-14, 15-20 section 5.4*

10. *How can you solve a linear differential equation with constant coefficients? When must there be solutions? What are wronskians and what do they tell us? Typical problems from sec. Problems 29-36 section 4.2.*

11. *How can you solve systems of linear differential equations. What you need to do in each case: real distinct eigenvalues, real repeated eigenvalues, complex eigenvalues.*

12. *Find a Fourier series for a given periodic piecewise continuous function. Typical problems from section 10.2*

13. *Find a Fourier series converging to a given function defined on an interval. In particular find sine or cosine series.*

14. *Solve partial differential equations using separation of variables.*