

Numerical Methods II

Review for Midterm II

Wednesday, March 31, 2004 in the Research I Lecture Hall

1. Stability of numerical methods for ordinary differential equations. In particular, understand Question 6(b) from last semester's final exam; understand stiffness (see, e.g., the example in SM, p. 345).
2. Methods for step size control and extrapolatory improvement of solutions. (No details, but review the basic ideas.)
3. Implementation issues for implicit multistep methods. (No programming required, but you should be able to comment on practical problems).
4. Linear boundary value problems, in particular the computation of the local truncation error.
5. Shooting: Understand the basic idea and be able to describe the procedure.
6. Matrix eigenvalue problems: Know the technical tools (plane rotation matrices, Householder reflections, Frobenius norm and its invariance under orthogonal transformations), Jacobi method, QR method, Gershgorin theorem, QR decomposition of a tridiagonal matrix by plane rotations, inverse iteration, elementary perturbation analysis.
7. Optimization: Golden ration search and Brent's method in one variable, know the basics of the Gradient and the Conjugate Gradient methods in several variables.