Second Computing Project
Math/CS 375, Fall 1997
Professor Coutsias

This project is due Oct. 7. Plan your work so that if your computer is down a short period, your project will not be late.

This project will count as part of your grade so you must work independently. It is permissible to discuss the project with your instructor, fellow students, and friends. However, the computer programs and report must be done only by the student doing the project.

The project is to use the textbook's procedures Factor and Solve for solving linear systems and to examine the stability of some problems. Specifically, you are asked to:

1. Find out how to create matrices and vectors using your favorite language, (f77, c, c++, or Matlab) and how to use Factor and Solve.
2. Use the routines in item 1 to solve systems with the following coefficient matrices:

   (i) $a_{ij} = e^{-(i-j)^2}$, $n = 8, 20$.
   (ii) $a_{ij} = \sin(ij\pi/(n+1))$, $n = 16$.
   (iii) $a_{ij} = \frac{1}{i+j-1}$, $n = 8, 20$.

   In all cases solve $Ax = b$ where b is chosen so that the true solution is $x_i = 1$ for all i.
3. Compute the maximum norm of the error and of the residual. Also note the approximate condition number of the matrices as computed by Factor. Check to see if the relative errors and residuals satisfy the fundamental inequality derived in class.

A well-written description of all your results should be included. Grading will approximately follow these guidelines: Correct use of Factor and Solve 25%, completion of all examples 25%, completion of the error analysis 35%, discussion of results 15%.