Math 712, **Homework Set 5**, October 11, 2005
Due Wednesday, October 19

In this HW set you will write a program to implement the Crank-Nicolson scheme using the Thomas algorithm to solve a simple IBVP for the PDE $u_t + u_x = 0$. To that effect read Section 3.5 of the textbook. You may want to first write a program to solve a test linear system of small dimension with a tridiagonal coefficient matrix (pick numbers in Eqs. (3.5.1)-(3.5.2) in our textbook, or look for examples in the textbook you used for MATH612, Chapter 8). You should have done such a program in previous courses so this part is easy.

Once you have a handle on the Thomas algorithm, do **Problem 3.5.1** from our textbook. Produce a log-log graph of the error in the discrete L_2 norm versus the mesh size h and determine the order of accuracy of the method. In addition to the mesh sizes in the problem also run your code with $h = 1/80$ and $h = 1/160$ in order to have a complete picture of the convergence of the scheme.

Make sure you follow the *Note:* given in the problem statement.