Math 712 Homework Assignment 5
Due: Monday Nov. 24

Instructions: *1. Everything must be returned in report form and must be type-written.*
2. You must submit your code.
3. Late assignments are NOT accepted.

Problem. Consider the initial-boundary value problem for the heat equation in a rectanglar domain:

$$u_t = u_{xx} + u_{yy}, \quad x \in [0, a], \quad y \in [0, b], \quad t \in [0, T]$$

$$u(x, y, 0) = u_0(x, y), \quad x \in [0, a], \quad y \in [0, b]$$
$$u(x, 0, t) = f_1(x, t), \quad u(x, b, t) = f_2(x, t)$$
$$u(0, y, t) = g_1(y, t), \quad u(a, y, t) = g_2(y, t)$$

(a) Implement the Peaceman-Rachford ADI method for solving this problem. Make sure that you use the Thomas algorithm to solve the tridiagonal systems and you have the right boundary conditions for the intermediate variable.

(b) Construct a particular example with known analytical solutions and use that example to test your program. Convince yourself and me that your code is correct by checking the order of accuracy and the computational time of your algorithm.