

MATH 497 / 597 – Homework 6

Your work on this assignment must be handed in by Tuesday, 12 November 2002 at 3:15 p.m. GOOD LUCK!

1) Write code to solve the two dimensional Poisson equation (9.1.8) on the unit square $0 \leq x, y \leq 1$ with boundary conditions (9.1.9). Undergraduates may assume that $\Delta x = \Delta y$ while graduate students' code must allow for the possibility that $\Delta x \neq \Delta y$.

2) Write code to solve the two dimensional heat equation (9.1.3) on the unit square via the ADI method. Use Dirichlet boundary conditions on all four sides. All may assume that $\Delta x = \Delta y$.

3) Write code to solve the nonlinear differential equation

$$u'' = u^2 + f(x)$$

with Dirichlet boundary conditions via both Picard iterations and Newton's method. (You get to choose f and the boundary conditions.) Use Matlab's `flops` command to compare the effort of the two methods for $N = 10, 20, 50, 100$, where N is the number of interior grid points. The stopping criterion for the iterations should be when $\|\mathbf{x}^k - \mathbf{x}^{k-1}\|_\infty < 10^{-6}$.

As before, send your codes to me via email attachments.