Assignment 3.

Due Wed., May 9.

Do ONE of the following two exercises:

(1) Using your code for the interior Dirichlet problem to determine the relevant jumps in the solution and its derivatives, embed your ellipse in a rectangle and evaluate the solution $u(P)$ at the lattice points of a uniform grid on the rectangle by using the Mayo idea. That is, determine the values of the discrete Laplacian to order h^2 (or, if you prefer, just to order h at the irregular points) and use these, together with computed boundary values on the edge of the rectangle, to form the right-hand side vector for a fast Poisson solver. In MATLAB, you can use **poisolv** from the pde toolbox to solve Poisson's equation on a uniform rectangular grid. See if you obtain better accuracy than before at points near the boundary of the ellipse.

OR

(2) Replace the matrix-vector multiplication routine in your GMRES solver for the interior Dirichlet problem with the fast multipole method. Try to determine if the time to solve the integral equation really grows like $O(n)$, where n is the number of boundary nodes.