

## “MINI PROJECT” 2 - MAT 661

due: Friday 2/3/06.

- (1) Code and test a tridiagonal matrix linear system solver which implements Gaussian Elimination.
- (2) Code and test Gauss-Seidel and Jacobi iterative solvers for diagonally dominant matrices.
- (3) Let  $A$  be our favourite  $(n - 1) \times (n - 1)$  tridiagonal matrix

$$n^2 \begin{bmatrix} 2 & -1 & 0 & \cdots & & 0 \\ -1 & 2 & -1 & & & 0 \\ 0 & -1 & 2 & & & 0 \\ \vdots & & & & & \vdots \\ 0 & & & & 2 & -1 \\ 0 & \cdots & & & -1 & 2 \end{bmatrix},$$

representing the negative second derivative operator on the space of suitably smooth functions with domain  $(0, 1)$  which satisfy zero boundary conditions. Let  $b = (2, 2, \dots, 2)^T \in \mathbb{R}^{n-1}$ .

- (a) Use your code from Problem 1) to solve  $Ax = b$ .
- (b) Use your code(s) from Problem 2) to solve  $Ax = b$ .
- (c) What Boundary Value Problem (BVP) did you just find approximate solutions to? What is the exact solution to this BVP? How good are your approximations?

Your report should have good pseudocodes *and/or* actual codes (in an appendix), graphical or tabular evidence that the codes work, some mathematics, and a short concluding paragraph summarizing your findings. Use proper mathematical notation, complete sentences and proper grammar, and identify/label all objects (graphs, tables, equations, codes).