

AMS 326 - Midterm Exam

Due Thursday, November 16, 2006

(Please hand in both code and results in hard copy.)

1. (15 points) The inverse of matrix A satisfies $AA^{-1} = I$. Using the column view of matrix-matrix multiplication we see that the j th column of A^{-1} is the vector x such that $Ax = e_j$, where e_j is the j th column of the identity matrix (e.g., $e_3 = [0, 0, 1, \dots, 0]^T$). By solving $Ax = e_j$ for $j = 1, \dots, n$ the columns of A^{-1} can be produced one at a time. Write a C++ function using LU factorization or Gaussian elimination to compute A^{-1} . Test your function to compute the inverse for the matrix

$$\begin{pmatrix} 0 & 0 & 6 \\ 1/3 & 0 & 0 \\ 0 & 1/2 & 0 \end{pmatrix}.$$

(Note: LU factorization gets 15 points, OR, Gaussian elimination gets 12 points. You need download matrix class from the course web.)

2. (10 points) You should implement Gaussian elimination, without pivoting, for band matrices by completing `band.cc`. You need download `band.h`, `band.cc`, `util.h`, `util.cc`, and `bandtest.cc` from the course web. Compile it using `"c++ band.cc util.cc bandtest.cc"`. Type `"a.out"` to run.