Homework #7 Due: Friday December 2 MTHBD/CMPBD 423

LU factorization with pivoting

1. Go into your folder in my P-drive and make a directory called HW7. You will write two function files and put them in this directory.

   (a) Make a function file called myLUP.m with the first line:

   function [L,U,P] = myLUP(A)

   This function should take a nonsingular n x n matrix A as input. It should return the matrices L, U, and P such that L is lower unit triangular, U is upper triangular, and P is a permutation matrix such that $LU = PA$. The permutation matrix P must be used to represent pivoting to avoid a zero diagonal term in the factorization process. P should not represent partial or scaled-partial pivoting.

   (b) Make a function file called myLUSolve.m with the first line:

   function x = myLUSolve(L,U,b)

   This function should take as input a lower unit triangular matrix L, an upper triangular matrix U, and a vector b. The matrices are n x n and the vector is n units long. It should return the solution to $LUx = b$ by first solving $Ly = b$ for y using forward substitution then solving $Ux = y$ for x using back substitution.

   I will use the program TestLinearSolve.m available from the class web site to test your functions. The first matrix in this program ($A1$) does not require any pivoting in order to obtain an LU factorization. The second matrix ($A2$) does require pivoting due to a zero diagonal term during the the factorization process. A copy of a successful run of this program is on the other side of this page. If you are printing this from the internet, no such 'other side' exist.

   Grading:

   - If you get the first problem with $A1$ correct you get 15/20.
   - If you get both parts correct you get 20/20
   - You can probably do this by hand. The functions should be written to handle any n x n matrix. If yours can only handle a 4 x 4 matrix, you get 0/20.