
Assignment 5, MATH/COSC 3416, Numerical Methods I

Due Date: Friday, April 1, 2011

Question 1 (Naive gaussian elimination)

- (a) Page 256, problems 7.1.3(c) and 7.1.3(d).
- (b) Page 256, problem 7.1.4.

Question 2 (The LU factorization)

- (a) (From a previous exam) Find the LU factorization of the following matrix by hand.

$$\mathbf{A} = \begin{bmatrix} 1 & 2 & 4 & 1 \\ 2 & 8 & 6 & 4 \\ 3 & 10 & 8 & 8 \\ 4 & 12 & 10 & 6 \end{bmatrix}$$

and use it to solve the linear system $\mathbf{AX} = \mathbf{b}$ with $\mathbf{b} = [21, 52, 79, 82]^T$

- (b) (From a previous exam) Find the LU factorization of the following matrix by hand.

$$\mathbf{A} = \begin{bmatrix} 1 & 1 & 0 & 3 \\ 2 & 1 & -1 & 1 \\ 3 & -1 & -1 & 2 \\ -1 & 2 & 3 & 1 \end{bmatrix}$$

and use it to solve the linear system $\mathbf{AX} = \mathbf{b}$ with $\mathbf{b} = [-2, 0, 1, 1]^T$

Question 3 (Inverse of a matrix)

- (a) Find the upper triangular form of the matrix

$$\mathbf{A} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 1 & 0 & 50 \end{bmatrix}$$

using our `gauss` function in file `gauss.m` (see course home page) to do the gaussian elimination to upper triangular form: $[A_{upper}, r] = \text{gauss}(A)$

Now use the `gaussSolve` function (which is in file `gaussSolve.m`) three times to find the inverse of the matrix **A**.

Note: If x_1 , x_2 , and x_3 are the three column vectors obtained then the inverse matrix A_{inv} can be constructed using the statement $A_{inv} = [x_1, x_2, x_3]$

Check your results using the Matlab `inv` function.

(b) Do (a) using our `luFactor` function in file `luFactor.m` and our `luSolve` function in file `luSolve.m`.