

Homework 4

MATH 5610 FALL 2016

NAME: _____

GRADE: _____

Problem 1. Implement the algorithm for Back Substitution for upper triangular square matrices.

Problem 2. Implement the algorithm for Forward Substitution for lower triangular square matrices.

Problem 3. Implement Gaussian Elimination for transforming the square matrix, A , to an upper triangular matrix, U .

Problem 4. Combine the codes you created for Gaussian Elimination and Back Substitution to create a code for solving the general square linear system

$$Ax = b$$

Problem 5. Test the code in Problem 4 using the following algorithm.

1. Write a code that will generate a square matrix of size n using random numbers between 0 and 1. Then add the value $10 \times n$ to each of the main diagonal entries.
2. Next, write a code that performs a matrix vector product. Note that we will reuse this code a number of times in the semester.
3. Initialize a vector of size n and set the entries to ones. Then compute the product of the “random” matrix, A , and the vector of ones. The output from this operation is the right hand side for

$$Ax = b$$

the test linear system.

4. Compute the solution of the test linear system using the code from Problem 4 for $n = 10, 20, 40, 80, 160$.

The method for generating a test linear system in this problem will be used for a number of algorithms this semester.

Problem 6. Complete Problem 1. at the end of Chapter 5 in the textbook.

Problem 7. Complete Problem 4. at the end of Chapter 5 in the textbook.

Problem 8. Complete Problem 1. at the end of Chapter 4 in the textbook.

Problem 10. Complete Problem 2. at the end of Chapter 4 in the textbook.
