Homework 6

MATH 5610 FALL 2016

NAME: GRADE:_____

Problem 1. Implement an algorithm for computing the Cholesky decomposition of a square matrix. Note that your code should test the input matrix to see if the matrix is symmetric. The code will not need to test the matrix to see if it is positive definite. Testing for positive definiteness requires more work than you need to do in this problem.

Problem 2. Implement a code that uses the Cholesky decomposition code you developed in the Problem 1 to test a matris to see if the matrix is symmetric and positive definite.

Problem 3. Implement a code that will compute the 1-norm of a real square matrix.

Problem 4. Implement a code that will compute the ∞-norm of a real square matrix.

Problem 5. Implement a code that will estimate the condition number of a square matrix using codes that you have developed during the past few weeks in this course.

Problem 6. Determine the amount of work needed to estimate the condition number of a matrix by embedding counters for the operations in your code. Produce a graph of the number of operations as a function of the matrix size. This means you will need to generate some generic matrices of different sizes. There is an example of how to do this in a previous homework set.

Problem 7. Implement an efficient algorithm for computing the solution of a tridiagonal linear system. Use matrices developed in class to test your code. That is, write a routine that will produce an tridiagonal matrix such that

$$a_{i,i} = -2.0, a_{i,i+1} = 1.0, a_{i+i,i} = 1.0,$$

You will want to have the routine that generates the matrices take in the size of the matrix and then return the matrix in an efficient manner.
