EECS 739: Homework 2

Due: Thursday, February, 26, 2015 (At the beginning of lecture)

Answer all of the questions listed below. I will choose one problem to grade; it will be worth 20 points. The submission instructions are identical to those for Homework #1.

You may work with at most one other student in the course to formulate ideas only; please write the name of the student you worked with at the top of your homework solutions.

Questions:

1. An upper Hessenberg matrix is given by

$$A_{ij} = 0, i > j + 1,$$

$$A_{ij} \neq 0, i \leq j + 1.$$

   Implement an efficient linear solver for the solution of upper Hessenberg linear systems. **You may use one of C, C++, Fortran, or Java for your coding on this question since we have not yet learned C++.**

   Demonstrate that your code obtains correct results.

   Submit timing results from the solution of an upper Hessenberg linear system with a 1000×1000 left-hand side matrix.

2. Determine the computational complexity of your upper Hessenberg linear solver in the above question.

3. Specify pseudocode for two parallel Gaussian Elimination algorithms. For this question, you should consider two different permutations of the i, j, and k indices for the triple loop. (See p. 468 for the psuedocodes for each of the six different serial algorithms.)

4. Choose one of your parallel Gaussian Elimination psuedocodes from the above question. Compare and contrast your method with the corresponding serial algorithm. **For this question, choose one of the methods for which the comparison is not available in the Karniadakis and Kirby book.**