Math 22 X14 Extra credit homework

Computational assignment #2

Directions: this homework is for extra credit, up to 2% extra credit over the whole course. This is a list of suggested exercises to work through; you are by no means required to complete them all. There is no due date for this homework; once you feel like you're finished you can drop it in the box outside Kemeny 008 (in the "Extra Credit" slot), email it to me or set an appointment with me to talk about it in person. If you need help with it please come directly to the instructor.

1. While most mathematical computer programs (like MATLAB and Mathematica) have built-in matrix multiplication just by doing "A*B", it's a good exercise to try and implement matrix multiplication using the formulas you see in the book. Try to use the least amount of for cycles for it.

2. Implement a function that builds a partitioned matrix given its blocks, and the multiplication of partitioned matrices (as defined in section 2.4). If you did exercise 1 of this assignment you should try to use that multiplication function, otherwise you can use the built-in multiplication. Remember that you first need to check if the partitions match.

3. Implement the LU algorithm of section 2.5. If you wrote the row-reduction code you can use parts of that and use a separate matrix to keep track of the operations. Try your hand both at the case without interchanges and with interchanges.

4. Implement an algorithm that takes a matrix and outputs its inverse. At this point you can either use the $\begin{pmatrix} A & I \end{pmatrix}$ algorithm and keep track of the row operations, or use the LU factorization to solve all the associated systems. You can also use LU and invert both L,U, see problem 17 section 2.5

5. If one of the applications we talked about in class interests you, feel free to come and talk to me. We can arrange for some topic-specific extra work that involves as much coding as you want. This is especially true for sections 2.6 and 2.7, where coding is not a huge factor.

6. If you're looking for some problems that would test your algorithm, any problem in the book with the [**M**] symbol is meant to be solved with a [**M**]atrix program such as MATLAB or Mathematica. More specifically, good problems to work on at this stage are

   - Section 1.9: 37-40
   - Section 1.10: 9-13
   - Section 2.1: 35-41;
   - Section 2.4: 26-27;

- Section 2.5: 31-32;
- Section 2.6: 13-15;
- Section 2.7: 21-22.