Math 22 X14 Extra credit homework

Computational assignment #1

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. Pick a programming language of your choosing and install the corresponding application. Among the mathematical coding languages, if you are more modeling or numerically minded I suggest MATLAB, while if you're more into symbolic computations Mathematica is a better choice. But any language of your choosing (including C) is fine. If you're not sure what to pick MATLAB is a good default.

2. Implement the row-reduction algorithm of section 1.2.

3. With the algorithm in place, try an play around with it for a while: compare it to the built-in algorithm in the application you're using (usually called **rref**), try it on a few examples from the book or your notes to make sure it works, try and improve the code by reducing its computational complexity. Feel free to experiment with it however you want.

4. 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 1.4: 37-42;
   - Section 1.6: 3-11.

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Proofwriting assignment #1

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1. Search the web for a pdf about "Introduction to proofs" or something similar. An example of source could be

   http://www.math.dartmouth.edu/~m22x12/WritingProofs.pdf

   but feel free to find something else (and email it to me once you've picked it). Try to focus on the overall sense of what the text is saying, instead of getting bogged down in specifics. For example in the pdf above focus on understanding why the points in bold text are important.

2. Search the web for an explanation of how the following methods of proof work, and write a short paragraph explaining it in your own words, together with an example of a proof that's done this way.

   - Proof by contrapositive
   - Proof by contradiction
   - Proof by example/counterexample
   - Proof by induction

3. Read the proofs of theorem 4 and 5 in section 1.4. Make sure you understand the logical implications that make it a proof, and try to rewrite the proof without looking at the book.

4. Try your hand at some proofs with the following exercises:

   - Exercises 23,24 (Section 1.1); 21,22 (1.2); 23,24 (1.3); 23,24 (1.4); 23,24 (1.5). These are all true/false questions that require you to justify the answer. Each of these is in fact a small proof.
   - Exercise 25 in Section 1.5 will guide you through proving one of the theorems we saw in class.