Graduate Programming Languages
Homework Assignment 0

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Exercise 1: Bookkeeping. If your UVA ID is `mst3k`, you must email me your answers to this homework in a single PDF file named `mst3k.pdf`. Note that `.docx` is *not* `.pdf`.

Exercise 2: More Bookkeeping. In your PDF, indicate whether you are taking the class for a letter grade, taking it pass/fail, or just sitting in. In addition, indicate one thing you like about the class and one thing you would change about it. Finally, give me an interesting piece of computer science trivia. (Bonus points: give an English word other than "bookkeeping" that contains three adjacent doubled letters. Hint: use an "extended" regular expression and `/usr/dict/words`.)

Exercise 3: Set Theory. This exercise is meant to help you refresh your knowledge of set theory and functions. Let X and Y be sets. Let $\mathcal{P}(X)$ denote the powerset of X (the set of all subsets of X). There is a 1-1 correspondence (i.e., a bijection) bewteen the sets A and B, where $A = X \to \mathcal{P}(Y)$ and $B = \mathcal{P}(X \times Y)$. Note that A is a set of functions and B is a (or can be viewed as a) set of relations. This correspondence will allow us to use functional notation for certain sets in class. This is Exercise 1.4 from page 8 of Winskel's book. *Do one of the following:*

- Demonstrate the correspondence between A and B by presenting an appropriate function and proving that it is a bijection. For example, you might construct a function $f : B \to A$ and prove that f is an injection and a surjection.

- Write "I understand this background material" but do not do the problem. You will receive full credit for this question. We use the Honor system.

Exercise 4: BLAST Experiments. Download the BLAST software model-checking tool using the instructions on the homework webpage. Read through enough of the BLAST manual to run the tool on the `tcas.i` testcase provided on the homework webpage. Use the two commands listed. For each command, copy down the last ten lines of output from BLAST and include them as your answer to this question.

Do *not* use BLAST on Cygwin, no matter what the documentation says. The Linux binaries should work out of the box on the department Linux server `power1.cs.virginia.edu`.

Hint: if your output for the `PROPERTY1A` command does not include the substring "`The system is safe`", you are doing something wrong.

Exercise 5: BLAST Analysis. What is going on when you run BLAST using the commands listed? In at most three paragraphs, summarize your experience with the BLAST tool. What does `-L PROPERTY1A` mean? Is `TCAS` a reasonable test suite? What has been proved? Did you find BLAST to be a usable tool? For full credit, do not restate my lecture on counter-example guided abstraction refinement; instead, discuss your thoughts and experience using the BLAST tool. Focus on threats to validity (e.g., imagine that you were writing a paper and using this as an experiment) over usability.

Both your ideas and also the clarity with which they are expressed (i.e., your English prose) matter. I should be able to identify your main claim, the arguments you are bringing to bear, and your conclusion.