7 Homework

Due: Monday, November 19, 2007.

Instructions

- Please, review the homework grading policy outlined in the course information page.
- On the *first page* of your solution write-up you *must* make explicit which problems are to be graded for regular credit, whic problems are to be graded for extra credit, and which problems you did not attmept. Use a table that looks like this:

Problem	1	2	3	4	5	6	7	8	9	...
Credit	RC	RC	RC	EC	RC	EC	NA	NA	EC	...

  where "RC" denotes "regular credit", "EC" denotes "extra credit", and "NA" denotes "not attempted". Failure to include such a table will result in an arbitrary set of problems being graded for regular credit, no problems being graded for extra credit, and a 5% penalty assessment.
- You must also write down with whom you worked on the assignment. If this varies from problem to problem, write down this information separately with each problem.

Problems

Required: 5 of the following 7 problems
Points: 20 points per problem

1.
   - Prove that the collection of decidable languages is closed under concatenation and star.
   - Prove that the collection of Turing-recognizable languages is closed under concatenation and star.

   For this problem, give only informal high-level description of any required Turing Machines. *Hint:* You may find it helpful to use non-deterministic and/or multi-tape Turing Machines.

2. Given an arbitrary Turing machine (or Turing machine variant) M, let M' be the same machine but with the accept and reject states swapped. Is it possible that there exists strings accepted by:

   i both M and M'; or

   ii neither M nor M';

   when

   a M is a (deterministic) decider?

   b M is a (deterministic) recognizer?

   c M is a (nondeterministic) decider?

   d M is a (nondeterministic) recognizer?

   Note that 8 answers are required. Justify all answers.

3.
   - Do the Problem 4.2
   - Do the Problem 4.12

4. Do the Problem 4.3

5. Do the Problem 4.4

6. Prove that $ONE_{DFA} = \{< D > | D \text{ is a DFA and } |L(D)| = 1\}$ is decidable.

7. Do the Problem 4.26