9 Homework

Due: Wednesday, December 5, 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: 4 of the following 5 problems
Points: 25 points per problem

1. a Show that **P** is closed under complement and concatenation.

   b Let A be a decidable language and let D be a polytime decider for it. Consider the following algorithm for deciding whether a given non-empty string s of length n belongs to A^*: For every possible way of splitting s into non-empty substrings $s = s_1 s_2 ... s_k$, run D on each substring s_i in that split and *accept* iff all substrings are accepted by D for some split. Derive an exact expression for how many possible such splits there are as a function of $n = |s|$. Use this to conclude that this algorithm does not run in polynomial time, even though D does.

c What does the result of part b imply about the closure of **P** under the star operation?

2. Do the Problem 7.10

3. Do the Problem 7.12

4. Do the Problem 7.23

5. Do the Problem 7.25