8 Homework

Due: Wednesday, November 28, 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, which problems are to be graded for extra credit, and which problems you did not attempt. Use a table that looks like this:

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

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. Do the Problem 5.1
2. Do the Problem 5.9
3. Do the Problem 5.20
4. Use a mapping reduction to prove that

\[
DECIDER_{TM} = \{ < M > \mid M \text{ is a TM and } M \text{ is a decider} \}
\]

is undecidable.
5. Prove that \( REGULAR_{TM} \) (defined on p. 191 of Sipser) is neither Turing-recognizable nor co-Turing-recognizable. \textit{Hint:} For part of this you should create one new mapping reduction.