Theory of Computation

Mid-Term Examination on November 11, 2008

Fall Semester, 2008

Problem 1 (30 points). Show that REACHABILITY $\in$ NL.

Problem 2 (20 points). Does there exist a logarithmic-space reduction from PALINDROME to CIRCUIT VALUE? Briefly justify your answer.

Problem 3 (30 points). Prove or disprove that MAX CUT remains NP-hard for graphs whose number of nodes is a multiple of 3.

Problem 4 (20 points). Let L be a recursive language. Prove that it is recursively enumerable.

Problem 5 (30 points). Is it possible that exactly one inclusion in the chain

$$\text{NL} \subseteq \text{SPACE}(\log^9 n) \subseteq \text{PSPACE} \subseteq \text{EXP}$$

is proper?