CSE 200
Computability and Complexity
Homework 4
Space Complexity and Probabilistic Time Complexity Due Monday, June 5

May 29, 2006

Give proofs for each problem. Proofs can be high-level, but be precise. You may use without giving a proof any result proved in class or in the textbook.

2-SAT The 2-SAT problem is to decide Satisfiability for CNF formulas with at most 2 literals per clause. Prove that $2-SAT$ is NL-complete (under deterministic logspace many-one reductions). You can use without proof that directed connectivity is NL-complete.

Polynomial hierarchy Remember that the levels of the polynomial hierarchy are $\Sigma^1 = NP$, $\Sigma^{i+1} = NP^{\Sigma^i}$. Prove that $Sigma^i \subset PSPACE$ for every i.

(Hint: Prove $NP^{PSPACE} = PSPACE$.)

Randomized complexity classes Prove that if $RP \neq Co-RP$, then there is some language in BPP that is neither in RP nor in $Co-RP$.

Closure for probabilistic complexity Remember that for complexity class C, P^C is the class of all decision problems poly-time Turing reducible to L for some $L \in C$. Prove that $P^{BPP} = BPP$. Is the same true for RP?