CSE 200
Computability and Complexity
Homework 1
Models of Computation, Efficient Computation, and Undecidability
Due Monday, April 28

April 22, 2008

1. Problem 3.12 on page 161, but also show that the class $P_{leftresetTM}$ of languages recognizable in polynomial time for left reset machines is the same as for standard TM's.
2. Consider the language $L = \{x + y = z|$ x, y, z are binary integers, so that $x + y = z\}$. Prove that this language is decideable in time $O(n^2)$ on a one-tape Turing Machine. Prove a matching lower bound ($\Omega(n^2)$) for one-tape TMs.
3. Show that a function $f(x)$ from $\{0,1\}^*$ to $\{0,1\}^*$ is in FP (functions computable in polynomial time) if and only if there is a k so that $|f(x)| \in O(|x|^k)$ and the language $\{(x, i, b)|i \leq |f(x)|$ and the i'th bit of $f(x)$ is $b\}$ is in P.
4. Let $L = \{< M, w > |M$ is a Turing Machine program so that there is an input $y \in \{0,1\}^*$ so that M halts on y in $100|y|$ steps and $M(y) = w$ $\}$ Is L recursive? Is L recursively enumerable? Is L co-r.e.?
5. Give an example of a language L that is neither R.E. nor co-R.E.