CSE 431: Theory of Computation
Assignment #1
March 31, 2000
due: Friday, April 7

1. Exercise 3.7.
2. Give a series of careful definitions of a nondeterministic Turing machine, analogous to the ones given in lecture. You should include definitions of the 7-tuple, configuration, 1-step transition relation (what the text calls "yields" and for which I used the symbol $\underset{M}{\vdash}$), multistep transition relation ($\overset{*}{\underset{M}{\vdash}}$), what it means for M to accept w, and $L(M)$. Be particularly careful about those places where nondeterministic Turing machines differ from deterministic ones.
3. Problem 3.14.
4. Problem 3.19.
5. (a) Consider the language $C = \{a^k \mid k \geq 2 \text{ is a composite integer}\}$ over the alphabet $\Sigma = \{a\}$. Show that C is decidable. You may use Example 3.6 from the text.

   (b) Consider the language $C' = \{a^k \mid k \geq 2 \text{ is a prime integer}\}$ over the alphabet $\Sigma = \{a\}$. Show that C is decidable.