Homework Assignment #3
Due: October 10, 2012

1. A no-writing Turing machine is one that never changes any character written on its tape. (Thus, in the transition function of such a machine, if $\delta(q, a) = (q', a', d)$ then $a = a'$.) Let L be a language. Assume there is a no-writing Turing machine M that decides L.

(a) Prove that there exists a constant k such that, for every input string x, M never visits the same square of the tape more than k times.

(b) Show that you can construct a no-writing Turing machine M' that decides L without ever moving beyond the first $n + 2$ squares of the tape on any input of length n.

(c) Prove that $L \in TIME(n)$.

2. Recall that if L is a language, then $L^* = \{x_1 x_2 \dots x_k : k \geq 0 \text{ and each } x_i \in L\}$. Prove that if $L \in P$ then $L^* \in P$.