Homework Assignment #1
Due: March 19, 2009

1. In this question, we consider Turing machines with a single tape. Suppose we modify the definition of a Turing machine so that it gets two additional powers: it can insert a new, blank square into the middle of the tape (to the right of the current head location) or it can cut one square out of the tape. Such a machine is called a splicing Turing machine (STM).

(a) Show how to simulate an STM using an ordinary Turing machine. Make your simulation as efficient (in terms of time) as you can.

(b) If an STM runs in $T(n)$ steps (in the worst case) on inputs of size n, what is the worst-case running time of your simulation of it?

(c) Show that at least one STM cannot be simulated any faster than your simulation works (ignoring constant factors).