

CMSC 28100-1 Spring 2015  
Homework 4

April 24, 2015

- 1. (HMU 9.3.1)** Show that the set of Turing machine codes for TMs that accept all inputs that are palindromes (possibly along with other inputs) is undecidable.
- 2. (HMU 9.3.2)** The Big Computer Corp. has decided to bolster its sagging market share by manufacturing a high-tech version of the Turing machine, called BWTM, that is equipped with *bells* and *whistles*. The BWTM is basically the same as your ordinary Turing machine, except that each state of the machine is labeled either a "bell-state" or a "whistle-state". Whenever the BWTM enters a new state, it either rings the bell or blows the whistle, depending on which type of state it has just entered. Prove that it is undecidable whether a given BWTM  $M$ , on given input  $w$ , ever blows the whistle.
- 3. (HMU 9.3.3)** Show that the language of codes for TMs that, when started with blank tape, eventually write a 1 somewhere on the tape is undecidable.
- 4. (HMU 9.3.5)** Let  $L$  be the language consisting of pairs of TM codes plus an integer,  $(M_1, M_2, k)$ , such that  $L(M_1) \cap L(M_2)$  contains at least  $k$  strings. Show that  $L$  is RE, but not recursive.