Introduction to Computer Science Theory (4003-380-01)
Prof. Richard Zanibbi (20103, Spring 2011)
Homework 7, Due 4pm, Tuesday May 3, 2011

All questions are written for this assignment; submit them through myCourses or on paper before the start of class. If you work in a group of two, submit your answers only once, and make sure to include both your names on your submitted work.

Questions (40 points in total)

1. Consider the Turing machine M_1, defined and illustrated in Example 3.9 in the course textbook. Provide the sequence of configurations that M_1 enters when started on the input strings below. **Please write the configurations as a list, with one configuration per line.**
    (a) 1##1
    (b) 10#10

2. Show that decidable languages are closed under the operations of:
    (a) Complement
    (b) Intersection

3. Give a formal definition of an enumerator. Use a two-tape Turing machine, which uses its second tape as a printer. Provide a definition of the enumerated language.

4. Express the problem of determining whether a DFA and a regular expression are equivalent, using a language of strings accepted by a Turing machine. Demonstrate that this problem is decidable.

5. Let $INFINITE_{PDA} = \{\langle M \rangle \mid M \ is \ a \ PDA \ and \ L(M) \ is \ infinite\}$. Show that $INFINITE_{PDA}$ is decidable. (see related Question 4.9 in the textbook)