CMSC 28100-1 Spring 2015
Homework 7

May 15, 2015

1. Show that a k-tape nondeterministic Turing machine running in a nondeterministic time $T(n)$ can be simulated by a 2-tape nondeterministic Turing machine running in nondeterministic time $O(T(n))$. Note that, unlike the case of deterministic time, there is no additional $\log(T(n))$ factor.

2. Show that if $\mathrm{DSPACE}(n) \subseteq \mathrm{P}$, then $\mathrm{PSPACE} = \mathrm{P}$. Recall that $\mathrm{PSPACE} = \cup_{k \geqslant 1}\mathrm{DSPACE}(n^k)$. *Hint:* padding.

3. Show that $\mathrm{DSPACE}(n) \neq \mathrm{P}$. *Hint:* you may find the statement of the previous problem useful. Even if you were unable to complete Problem 2, you may use its statement in this one.

4. Show that $\mathrm{NSPACE}(n) \neq \mathrm{P}$. As before, you may use the statement of Problem 2 in this problem.