# Homework Assignment #7
## Due: November 26, 2012

**1.** Show that STRONGLY-CONNECTED (defined on the previous problem set) is **NL**-complete.

**2.** Problem 9.12 on page 389 the textbook (page 361 in the second edition).

**3.** If $L$ is a language over the alphabet $\{0,1\}$, define $L' = \{x\#0^{|x|^2} : x \in L\}$.

   **(a)** Prove that $L' \in \mathbf{P} \Rightarrow L \in \mathbf{P}$.

   **(b)** Prove that there is a language $L$ such that $L' \in \mathbf{SPACE}(\sqrt{n})$ and $L \notin \mathbf{SPACE}(\sqrt{n})$.
     Hint: use the space hierarchy theorem.

   **(c)** Prove that $\mathbf{P} \neq \mathbf{SPACE}(\sqrt{n})$.