1. It is known that $\text{SPACE}(n) \subseteq \text{SPACE}(n^2)$ (this is proper containment). Use this fact to show that $\text{SPACE}(n) \neq \text{NP}$. (Hint: It will be a proof by contradiction. Consider a language $A$ in $\text{SPACE}(n^2) - \text{SPACE}(n)$. Construct a new language $A' = \{w#|w|^2 : w \in A\}$ where $#$ is a new symbol. Show that $A' \in \text{SPACE}(n)$. Then move on to a contradiction.)

2. Show that the set $\text{PAREN} =$ the set of matched parentheses is in $\text{SPACE}(\log n)$. Examples: $((())()) \in \text{PAREN}$ but $(()) \not\in \text{PAREN}$. 