Regular Languages and Finite Automata

Show that if $L$ is a regular language then the set of strings in $L$ of odd length is also a regular language. Is the same true of strings of even length? Justify your answer. [8 marks]

If $L$ is regular language let $L'$ be the set of strings in $L$ that are palindromes. Is it possible that $L'$ is regular? Will $L'$ necessarily be regular? Explain your answer with suitable examples and proofs. [6 marks]

It is known that the language $Pal$ consisting of all palindromes is not regular. If possible find a regular language $L$ such that $L$ is a subset of $Pal$, or if this is not possible explain why. Similarly either find a regular language $L'$ so that $Pal$ is a subset of $L'$, or again explain why this can not be done. [6 marks]