Problem 1: Let $X$ be a compact metric space. Let $(f_n)_{n=1}^\infty$ be a sequence of real-valued functions on $X$ that converges pointwise to a real-valued function $f$. Suppose that there exists a finite $C$ such that $\text{Lip}(f_n) \leq C$ for all $n$. Prove that $(f_n)_{n=1}^\infty$ converges uniformly to $f$. 