Littlewood's Three Principles- HW Problems

1. Let $f_n(x) = \frac{1}{nx+1} \quad 0 < x \leq 1$, and $f(x) = 0 \quad 0 < x \leq 1$.

   Prove $f_n \to f$ pointwise on $0 < x \leq 1$, however f_n does NOT converge uniformly to f on $0 < x \leq 1$. But $f_n \to f$ uniformly on $[\alpha, 1]$ for any $0 < \alpha < 1$.

2. Find an example that shows that Egoroff's theorem can fail if we drop the assumption that the measure of the common domain is finite.