1. Prove or disprove: if f_n, g_n are uniformly convergent sequences on a set E then $f_n g_n$is also.

2. Recall $C[0,1]$ is a complete space with the sup norm, $||f|| := \sup|f|$. In particular, $C[0,1]$ is a metric space with $d(f,g) := ||f-g||$. An easy way to remember Arzela-Ascoli's theorem is that is gives sufficient conditions for compactness of subsets of $C[0,1]$. Prove this; namely,

   (a) Show that if $A \subset C[0,1]$ is closed, bounded (both in the sup norm), and equicontinuous, A is compact.

   (b) Exhibit an A which is not compact and which satisfies any two of these three conditions. (hint, $A := \{f_n(x) = \dfrac{1}{nx+1}\}$ is closed (every point is isolated!) and bounded but not compact (hence not equicontinuous!)).