1. Let $f, f_1, f_2, \ldots : A \to \mathbb{R}$, and let $t \in A'$. Suppose $f_n \to f$ uniformly, and for each $n \in \mathbb{N}$ the limit $\lim_{x \to t} f_n(x)$ exists. Prove that $\lim_{x \to t} f(x)$ exists.

2. Let $f, f_1, f_2, \ldots, g, g_1, g_2, \ldots : A \to \mathbb{R}$. Suppose $f_n \to f$ uniformly and $g_n \to g$ uniformly.

   (a) Prove that $f_n + g_n \to f + g$ uniformly.
   (b) For each $n \in \mathbb{N}$ define $f_n : \mathbb{R} \to \mathbb{R}$ by

   $$f_n(x) = x + \frac{1}{n},$$

   and define $f : \mathbb{R} \to \mathbb{R}$ by $f(x) = x$. Prove that $f_n^2 \not\to f^2$ uniformly.

3. Let $c, d \in \mathbb{R}$ with $c < d$, and let $f, f_1, f_2, \ldots : A \to [c, d]$. Also let $g : [c, d] \to \mathbb{R}$ be continuous. Suppose $f_n \to f$ uniformly. Prove that $g \circ f_n \to g \circ f$ uniformly.