

1. Prove that a sequence $\{a_n\}$ converges to L if and only if every subsequence $\{a_{n_k}\}$ has a further subsequence $\{a_{n_{k_i}}\}$ that converges to L .

Prove or find a counterexample to the each of the following (hint one of these follows immediately from a theorem in class so don't work too hard).

2. If $f : A \rightarrow \mathbb{R}$ is continuous and $[a, b] \subseteq f(A)$ then $f^{-1}([a, b])$ is a closed interval.
3. If $f : A \rightarrow \mathbb{R}$ is continuous and $[a, b] \subseteq A$ then $f([a, b])$ is a closed interval.