**Problem 1:** Given a sequence \( \{a_n\}_{n \in \mathbb{N}} \) of reals let \( A \) be the set of all \( x \in \mathbb{R} \) for which there is a subsequence \( \{a_{n_k}\}_{k \in \mathbb{N}} \) with \( \lim_{k \to \infty} a_{n_k} = x \). (We called this the set of accumulation points or subsequential limits of \( \{a_n\}_{n \in \mathbb{N}} \).) Prove that
\[
\forall x \in \mathbb{R}: x \in A \iff \left( \forall k \in \mathbb{N}: A_k := \{n \in \mathbb{N}: |a_n - x| < \frac{1}{k+1}\} \text{ is unbounded} \right)
\]

**Problem 2:** Let \( \{a_n\}_{n \in \mathbb{N}} \) be a bounded sequence with
\[
b := \liminf_{n \to \infty} a_n < c := \limsup_{n \to \infty} a_n
\]
Let \( A \) be the set of accumulation points of \( \{a_n\}_{n \in \mathbb{N}} \). Do as follows:
1. Prove that \( b, c \in A \),
2. Assuming that also \( \lim_{n \to \infty} (a_{n+1} - a_n) = 0 \)
   prove that \( A = [b, c] \).

**Problem 3:** Ex 10.6, PAGE 65

**Problem 4:** Ex 11.2, PAGE 76

**Problem 5:** Ex 11.4, PAGE 76

**Problem 6:** Ex 11.8, PAGE 77

**Problem 7:** Ex 14.2, PAGE 104

**Problem 8:** Ex 14.6, PAGE 104

**Problem 9:** Ex 14.8, PAGE 104

**Problem 10:** Ex 14.12, PAGE 105