Let \((s_n)\) and \((t_n)\) be real-valued sequences.

1. Let \(k \in \mathbb{R}\). Prove from the definition that if the sequence \((s_n)\) converges to \(s \in \mathbb{R}\), then the sequence \((ks_n)\) converges to \(ks\).

2. Prove from the definition that if \((s_n)\) converges to \(s \in \mathbb{R}\) and \((t_n)\) converges to \(t \in \mathbb{R}\), then \((s_n + t_n)\) converges to \(s + t\).

3. Suppose \((s_n)\) is convergent. Prove that it is bounded. \textit{Hint: apply the definition with} \(\epsilon = 1\).

4. Given an example of a bounded divergent sequence other than \((-1)^n\).

5. Prove if \((s_n)\) is bounded and increasing, then it converges.
   \textit{Hint: Does} \(\sup\{s_n \mid n \in \mathbb{N}\}\) \textit{exist? Can you prove that} \(\lim s_n\) \textit{is that least upper bound?}

6. Prove that if \((s_n)\) is an unbounded increasing sequence, then \(\lim s_n = +\infty\).

7. If \((s_n)\) is monotone, what can you conclude about \(\lim s_n\)? Justify your answer.