1. ASSIGNMENT 6

1.1. **Problem 1.** (2.2.0 b) Decide whether the following statement is true or false. If it is true, provide a proof. If it is false, provide a counterexample.

$$\text{If} \quad x_n \to -\infty \quad \text{then} \quad \frac{1}{x_n} \to 0 \text{ as } n \to \infty$$

1.2. **Problem 2.** (2.3.4) Suppose $x_0 \in \mathbb{R}$ and

$$x_n = \frac{1 + x_{n-1}}{2} \quad \text{for} \quad n \in \mathbb{N}$$

Use the Monotone Convergence Theorem to prove that $x_n \to 1$ as $n \to \infty$. (hint: consider two cases, $x_0 < 1$ and $x_0 \geq 1$)

1.3. **Problem 3.** (2.3.7) Suppose $E \subset \mathbb{R}$ is a nonempty bounded set and that $\sup E \notin E$. Prove that there exists a strictly increasing sequence $\{x_n\}$ that converges to $\sup E$ such that $x_n \in E$ for all $n \in \mathbb{N}$.