1. Finish the proof from class of the monotone convergence theorem by showing that if 
\((x_n)_n\) is a sequence that is bounded below and decreasing, then \((x_n)_n\) converges.

2. Show that if \(\lim_{n \to \infty} x_n = \infty\), then \((x_n)_n\) diverges. Recall that, by definition, \(\lim_{n \to \infty} x_n = \infty\) if for all \(B \in \mathbb{R}\), there is some \(N \in \mathbb{N}\) such that for all \(n \geq N\), \(x_n \geq B\).

3. Suppose that the series \(\sum_{n=1}^{\infty} a_n\) and \(\sum_{n=1}^{\infty} b_n\) both converge. Show that \(\sum_{n=1}^{\infty} (a_n + b_n)\) converges and its value equals \(\sum_{n=1}^{\infty} a_n + \sum_{n=1}^{\infty} b_n\).