1. Rudin p141 Problem 18.
3-4. Rudin p165 Ex. 2-3.
5. Suppose \( f_n : [0,1] \to \mathbb{R} \) converges pointwise to \( f \) on \([0,1]\) and

\[
\int_0^1 |f_n(x) - g(x)|^2 \, dx \to 0 \quad \text{as} \quad n \to \infty.
\]

Show that \( f = g \) if \( f \) and \( g \) are both continuous.

6. Find a sequence of smooth (let’s say twice differentiable) functions \( f_n : \mathbb{R}^n \to \mathbb{R} \) which converges uniformly to zero but the sequence of its derivatives diverge at every point \( x \).