**Homework set 5 — APPM5440**

**From the textbook:** 2.4, 2.5, 2.7, 2.8, 2.9. (Do 2.4, 2.5, and 2.7 first, and 2.8 and 2.9 only if you have time.)

**Problem 1:** Let $X = [0, \infty)$. Construct a sequence of functions $f_n : X \to \mathbb{R}$ that converges uniformly (and hence pointwise), but that does not converge in $L^2(X)$.

**Problem 2:** Let $X = [0, 1]$. Construct a sequence of functions $f_n : X \to \mathbb{R}$ that converges in $L^2(X)$ but such that the sequence of numbers $(f_n(x))_{n=1}^{\infty}$ does not converge for *any* $x \in X$.