§3.2: 6, 8, 12, 22, 26, 32, 42, 46

§3.3: 6, 8, 10, 20

Also do the following.

**Problem 1.** Evaluate \( \lim_{x \to 2} f(x) \), \( \lim_{x \to 2^-} f(x) \), and \( \lim_{x \to 2^+} f(x) \) for the following function \( f \):

\[
f(x) := \begin{cases} 
\cos(\pi x), & x \leq 2 \\
\sqrt{x}, & x > 2.
\end{cases}
\]

**Problem 2.** Let \( f : [-1,1] \to \mathbb{R} \) be the function defined by

\[
f(x) := \begin{cases} 
1, & \text{if } x \in \left( \frac{1}{n+1}, \frac{1}{n} \right) \text{ for some odd positive integer } n = 1, 3, 5 \ldots; \\
-1, & \text{if } x \in \left( \frac{1}{n+1}, \frac{1}{n} \right) \text{ for some even positive integer } n = 2, 4, 6 \ldots; \\
-1, & \text{if } x \in \left( \frac{1}{n}, \frac{1}{n-1} \right) \text{ for some odd negative integer } n = -1, -3, -5 \ldots; \\
1, & \text{if } x \in \left( \frac{1}{n}, \frac{1}{n-1} \right) \text{ for some even negative integer } n = -2, -4, -6 \ldots; \\
0, & \text{if } x = 0.
\end{cases}
\]

Sketch the graph of \( f \) (make sure to give yourself plenty of space, and note that you won’t be able to sketch all of the graph near the origin). Then compute \( \lim_{x \to 0} f(x) \) or determine that it does not exist, and justify your answer using sequences as in Definition 2 in §3.1.1. (Of course, think about the \( \sin(\frac{x}{x}) \) example we did in class.)

**Problem 3.** Is the function \( f(x) = |x| \) continuous at \( x = 0 \)? Justify your answer.

**Problem 4.** Let \( f \) and \( g \) be functions which are continuous at \( x = c \). Prove that if \( g(c) \neq 0 \), then the quotient function \( \frac{f}{g} \) is continuous at \( x = c \).