Problem Set 5
Real Analysis, MATH 5471
Due December 3, 2025

Do the following problems from the text, *Real Analysis*, 4th edition, by R. Bartle and D. Sherbert.

Section 6.2: 2a, 5, 10
Section 6.3: 3
Section 6.4: 4, 12
Section 7.1: 2, 8
Section 7.2: 2, 16

In addition, answer the following questions.

1. Use the Mean Value Theorem to show that $|\sin x - \sin y| \leq |x - y|$ for all $x, y \in \mathbb{R}$.

2. a) Evaluate the limit $\lim_{x \to 0^+} x^{\sin x}$.

b) Try to use L'Hospital's Rule to evaluate $\lim_{x \to \frac{\pi}{2}^-} \dfrac{\tan x}{\sec x}$ directly. Apply the rule at least twice. What happens? Then evaluate the limit by rewriting the fraction in terms of sines and cosines and simplifying.