Homework 1

A portion of the following problems will be graded according to the provided rubric.

1. Let $f: [a, b] \to \mathbb{R}$ be differentiable at $x \in (a, b)$ and $k \in \mathbb{R}$. Prove that $(kf)'(x) = kf'(x)$.
2. Let $f, g: [a, b] \to \mathbb{R}$ be differentiable at $x \in (a, b)$.
   a. Prove $\left(\frac{f}{g}\right)'(x) = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$, for $g(x) \neq 0$ (using limit definition)
   b. Use the limit definition to find the derivative rule for $h(x) = \frac{1}{x}$
   c. Combine part b with the Chain Rule to prove $\left(\frac{f}{g}\right)'(x) = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$, for $g(x) \neq 0$
3. Rudin page 114 problem 1
4. Rudin page 114 problem 2
5. Rudin page 114 problem 4
6. Rudin page 114 problem 5
7. Rudin page 114 problem 6
8. Rudin page 117 problem 22abc
9. Rudin page 119 problem 26
10. Rudin page 119 problem 27