1. We proved in class that
\[ \int f + g = \int f + \int g \quad \text{and} \quad \int cf = c \int f \]
for nonnegative measurable functions \( f \) and \( g \) and nonnegative constants \( c \). Using the definition
\[ \int f = \int f^+ - \int f^- \]
prove the two properties above hold for arbitrary measurable \( f \) and \( g \) and arbitrary constants \( c \).

2. Suppose that \( \int_A f = 0 \) for every measurable subset \( A \) of \( X \). Show that \( f = 0 \) almost everywhere on \( X \).

3. Let \( f \) be the function defined on \([0, 1]\) as follows. Define \( f(x) = 1 \) for \( x \in (1/3, 2/3) \), \( f(x) = 2 \) for \( x \in (1/9, 2/9) \cup (7/9, 8/9) \), and in general define \( f(x) = k \) on each interval \( \text{removed} \) in stage \( k \) in the definition of the Cantor set. Finally, define \( f(x) = 0 \) on the Cantor set. Show that \( f \) is not Riemann integrable, but that it is Lebesgue integrable. Compute its Lebesgue integral.