1. An extended real-valued function \( f \) is called \emph{lower semicontinuous} at the point \( y \) if \( f(y) \neq -\infty \) and \( f(y) \leq \liminf_{x \to y} f(x) \).

Let \( f \) be a lower semicontinuous function defined for all real numbers. What can you say about the sets

(i) \( \{ x : f(x) > \alpha \} \),
(ii) \( \{ x : f(x) \leq \alpha \} \),

2. Show that if \( E_1 \) and \( E_2 \) are measurable, then

\[
m(E_1 \bigcup E_2) + m(E_1 \bigcap E_2) = m(E_1) + m(E_2).
\]

\((m \text{ is the lebesgue measure}).\)

3. Assume that for a function \( f : \mathbb{R} \to \mathbb{R} \) there exists a constant \( C > 0 \) such that

\[
|f(x) - f(y)| \leq C|x - y|
\]

holds for all \( x, y \in \mathbb{R} \). Show that \( f \) carries Lebesgue null sets onto null sets.