1. Give an example of a sequence of Riemann integrable functions $f_n : [0, 1] \to \mathbb{R}$ such that, $|f_n| \leq 1$ for all $n \geq 1$, $f_n \to f$ everywhere, but $f : [0, 1] \to \mathbb{R}$ is not Riemann integrable.
2. Let \((X \times Y, \mathcal{F} \otimes \mathcal{G}, \mu \otimes \nu)\) be a \(\sigma\)-finite product space. Suppose \(C \in \mathcal{F} \otimes \mathcal{G}\) such that \(\mu \otimes \nu (C) = 0\). Show that \(\nu (C^x) = 0\) almost surely for all \(x\) with respect to the measure \(\mu\) and \(\mu (C^y) = 0\) almost surely for all \(y\) with respect to the measure \(\nu\).