Due: Wednesday, September 25th, 2025
Time:6:30pm on Moodle

1. Let $(\Omega, \mathcal{F}, \mathbb{P})$ be a probability space and $\{A_n\}$ be a sequence of events. Show that

$$\mathbb{P}(\limsup_{n\to\infty} A_n) \geq \limsup_{n\to\infty} \mathbb{P}(A_n)$$

2. Let $\mathbb{T}_2 = \{0\} \cup_{n=1}^{\infty} \{0,1\}^n$ be the binary tree. Show that for any $x, y \in \mathbb{T}_2$ there exists a unique point $c \equiv c(x, y, 0)$ such that $[x, 0] \cap [x, y] \cap [y, 0] = \{0\}$ where $[x, 0]$ and $[x, y]$ denote the vertices on the unique path between $x, 0$ and x, y respectively.