1. Define $\downarrow$ for sequences of sets and for sequences of real numbers, and verify that your definitions satisfy: If $(\Omega, \mathcal{F}, \mu)$ is a measure space and $A, A_1, A_2, \ldots \in \mathcal{F}$ and $A_n \downarrow A$ and $\mu(A_1) < \infty$, then $\mu(A_n) \downarrow \mu(A)$. Why is the condition $\mu(A_1) < \infty$ needed?

2. Exercises 1.1.1–1.1.4, 1.2.4, 1.3.4, 1.4.1 in Durrett (*Probability: Theory and Examples*, 4th edition)

3. In a probability space $(\Omega, \mathcal{F}, P)$, prove that if $A_1, A_2, \ldots \in \mathcal{F}$ are events such that $P(A_n) = 1$ for all $n \geq 1$ then
$$P\Big(\bigcap_{n\geq 1} A_n\Big) = 1.$$
Give an example of a family of events $\mathcal{J}$ (necessarily uncountable) such that $P(A) = 1$ for all $A \in \mathcal{J}$ but
$$P\Big(\bigcap_{A\in\mathcal{J}} A\Big) = 0.$$

Due Thursday 9/11