Quiz 1: Mathematical Statistics (MATH-UA 234)

In-class 09/13 (15min). Print your name and NetID and leave space at the edge of the page.

Name: _____ NetID: | | | | | | | | | | | |

Definition 1. A function $\mathbb{P}$ that assigns a real number $\mathbb{P}[A]$ to each event $A \subseteq \Omega$ is a probability distribution if it satisfies the following three axioms:

1. $\mathbb{P}[A] \geq 0$ for every A
2. $\mathbb{P}[\Omega] = 1$
3. If $A_1, A_2, \ldots$ are disjoint then
$$\mathbb{P}\left[\bigcup_{i=1}^{\infty} A_i\right] = \sum_{i=1}^{\infty} \mathbb{P}[A_i]$$

Problem 1. *Suppose $A, B \subset \Omega$ are events. Use the axioms of a probability distribution to:*

(a) Show $\mathbb{P}[\emptyset] = 0$.

(b) Show $A \subseteq B \implies \mathbb{P}[A] \leq \mathbb{P}[B]$.

(c) Show $0 \leq \mathbb{P}[A] \leq 1$.

(d) Show $\mathbb{P}[A^c] = 1 - \mathbb{P}[A]$.