**PROBLEM SET 2b**

1. Suppose $\{f_n\}$ is a sequence of continuous functions and let $E$ be the set of $x$'s where the seqeunce converges. Show that $E$ is Borel, and hence Lebesgue measurable.

2. Is the set of rational numbers equal to the intersection of some countable collection of open sets?

3. Is a subset of a Borel set Borel?

4. What is the conditional probability that a $x \in [0, 1]$ has first decimal digit even, given that its second binary digit is 1?

5. Let $X_n \subset [0, 1]$ be the set of $x$'s, whose $n$th binary digit is 1. Show these events are independent.