411 REAL ANALYSIS II WEEKLY QUIZ 2

Feb 5, 2016

Name:

By printing my name I pledge to uphold the honor code.

No books, notes, internet, etc. This should take about a half of an hour.

REMBER TO SIGN IN!

1. Connected

a) Please define what it means for a set to be connected.

b) List all of the connected sets in \mathbb{R}^1 . Why is this everything? What about \mathbb{R}^n ?

c) Define the Cantor set. What are some interesting properties it has?

d) How exactly is the theorem that the continuous image of a connected set is connected related to the Intermediate Value Theorem from calculus?

- **2.** Uniform Continuity. Let $f: X \to Y$ with X and Y metric spaces.
 - a) What does it mean for f to be uniformly continuous? Why is this definition necessary?

b) Why is uniform continuity so hard to achieve? Give several examples of functions that fail to be uniformly continuous and several examples of functions that are uniformly continuous.

c) What is our major class of uniformly continuous functions (aka our major theorem about uniform continuity)? What is the main idea of its proof?