

Summer 2014

Mathematics II Mock Exam

Daisuke Oyama

June 11, 2014

1. Write down the definition of convergence of a sequence in \mathbb{R}^N .
2. Problem like Problem 4 in Homework 1.
3.
 - (1) Write down the definition of an open set in \mathbb{R}^N .
 - (2) Write down the definition of a closed set in \mathbb{R}^N .
4. For $A \subset \mathbb{R}^N$, prove that the following two conditions are equivalent.
 - (i) A is a closed set.
 - (ii) For any convergent sequence $\{x^m\}_{m=1}^{\infty}$ of elements in A with $x^m \rightarrow \bar{x}$ as $m \rightarrow \infty$, we have $\bar{x} \in A$.
5.
 - (1) Write down the definition of a compact set in \mathbb{R}^N .
 - (2) Write down the definition of a continuous function from \mathbb{R}^N to \mathbb{R}^K .
 - (3) Let $X \subset \mathbb{R}^N$ be a nonempty compact set, and $f: X \rightarrow \mathbb{R}$ be a continuous function. Prove that f has a maximizer.
6. Problem like Problem 2 in Homework 8.
7. Problem like Problem 1 in Homework 9.