

MTH 327H: Homework 3

Due: September 21, 2018

1. Office hours the fourth week of classes are M 11:30-12:30, W 3-4, and Th 9-10.
2. Read Rudin Sections 1.23-1.38 and the Appendix to Chapter 1.
3. Do problems 1,3,4, and 5 from Rudin Chapter 1 and problems 2 and 3 from Rudin Chapter 2.
4. Construct explicit bijections between the following pairs of sets.
 - (a) $[0, 1]$ and $[1, 3]$.
 - (b) $(0, 1)$ and $(0, \infty)$.
 - (c) $[0, 1]$ and $[0, 1)$.
 - (d) $\mathbb{R} \times \mathbb{R}$ and \mathbb{R} . [Hint: Decimal expansions, but be careful.]
5. Prove that the following sets are uncountable:
 - (a) The set S of sequences of elements of $\{0, 1\}$.
 - (b) The power set $P(\mathbb{N})$ of the natural numbers.
6. Recommended but not required: Take a look at the sets enumerated in Question 4.1 in <https://link.springer.com/book/10.1007/978-1-4757-3971-8> and make sure you can identify the supremum and infimum of each set in \mathbb{Q} and \mathbb{R} , or explain why they don't exist.

Existence of decimal expansions will appear on Homework 4 (for reasons of length).