MATH 3326 **Intro to Abstract Mathematics** **Spring 2019**

Homework 24

Due Date: April 10

Problem 53. Below is a list of 10 ten-digit numbers made up of only 2's and 4's. Some digits are visible to you, while others are not. Find a ten-digit number made of only 2's and 4's that is not on the list, and **give a clear explanation as to why your answer is not on the list.**

$$
\begin{array}{lllllllllll}
n_1 = x & x & x & 2 & x & 4 & x & x & x & 4 \\
n_2 = x & x & x & x & 4 & x & 2 & x & 4 & x \\
n_3 = x & x & x & x & x & x & x & 4 & x & x \\
n_4 = 4 & x & 2 & x & x & x & 2 & x & x & x \\
n_5 = x & 2 & x & x & x & 2 & x & x & x & x \\
n_6 = x & x & 4 & x & 2 & x & x & x & x & x \\
n_7 = x & x & x & 4 & x & x & x & x & x & x \\
n_8 = x & x & 2 & x & x & x & x & x & x & x \\
n_9 = x & 2 & x & x & 4 & x & 2 & x & x & x \\
n_{10} = 4 & x & x & x & x & 4 & x & x & x & x
\end{array}
$$

Problem 54. Prove the the interval $(0, 1)$ is an infinite set.
(Hint: Think about Problem 2 on the in-class problem set from last week.)

Problem 55. Prove that $\mathbb{N} \times \mathbb{N}$ is countable.
(Hint: Think about the big theorem we proved in class on Monday the 8th.)