Week 2.

Homework: Due Wednesday September 21.

Read p.24-36 of Rudin.

Problems to turn in

Problem 1: Show that every real number between zero and one, inclusive, may be represented by a sequence $s_1, s_2, s_3, \ldots$, where every s_i is either zero or one. Hint: You can take the real number represented by $s_1, s_2, s_3, \ldots$ to be the supremum of the set of sums

$$\{ \sum_{i=1}^{k} s_i \; 2^{-i}, \quad k = 1, 2, \ldots \}$$

Is this representation unique?

Problem 2: Use problem 1 to conclude that the real numbers are uncountable.

Do problems 2,3,4 on page 43 of Rudin.

Additional suggested problem Problem 3 in Rudin shows that there are real numbers that are not algebraic. This proof is not constructive in the sense that it shows that there non-algebraic numbers, but it does not give an example of one. Challenge: Construct a number which is not algebraic.