**Math 5615H, Fall 2005** **Assignments** are due at the start of class on the given day

**Note:** Special Problems are like Term Papers. They must be well and neatly written, or typed, on standard size paper. Paper torn from spiral notebooks will not be accepted! Margins of one inch at least on all four edges and legibility are required. Special Problems will to some extent be scored competitively. The use of lined paper and writing on both sides of a page are quite acceptable.

**Assignment 12,** Book Problems: Due Dec 12

**Note:** *Justify your answers!*
Chapter 4, # 2, 4, 6.

**Assignment 11,** Book Problems: Due Dec 5

**Note:** *Justify your answers!*
Chapter 3, # 6cd, 7, 8, 14cd.

**Special Problem 8 and 9:** Due Dec 7

Chapter 3, # 16 and Chapter 3, # 18.

**Assignment 10,** Book Problems: Due Nov 28

**Note:** *Justify your answers!*
Chapter 3, # 3, 5, 6ab, 14ab.

**Special Problem 7:** Due Nov 23

Chapter 2, # 28.

**Special Problem 6:** Due Nov 18

Suppose that $\mathcal{K}$ is a collection of non-empty compact sets in a metric space $X$. Suppose also that the intersection of every pair of sets in $\mathcal{K}$ is in $\mathcal{K}$ (we say "$\mathcal{K}$ is closed under intersection"). Prove that there exists $x_o \in X$ such that $x_o$ belongs to every one of the sets $K$ in $\mathcal{K}$.

**Assignment 9,** Book Problems: Due Nov 14

Chapter 3, # 1, 2, 4.

**Special Problem 5:** Due Nov 16

Chapter 2, # 27.

**Assignment 8,** Book Problems: Due Nov 7

Chapter 2, # 19cd, 20, 24; Chapter 3, # 20.

**Assignment 7,** Book Problems: Due Oct 31

Chapter 2, # 10, 19ab, 23, 29.

**Special Problem 4:** Due Oct 26

Prove that a number $x \in \mathbb{R}$ is rational if and only if its decimal expansion ($x = m + \sum_{n=1}^{\infty} d_n/10^n$, where $d_n$ is one of the "digits" 0 through 9) is *eventually periodic,* which means that there exist $N \in \mathbb{N}$ and a positive $p \in \mathbb{N}$ such that for all natural numbers $n \geq N$, $d_{n+p} = d_n$.

Examples: $1/6 = .1\bar{6}$, $1/7 = .\overline{142857}$, where the bar above a "block" of digits indicates that the block repeats.

**Assignment 6,** Book Problems: Due Oct 24

Chapter 2, # 15, 16, 18 (use Special Problem 4's result, without proof, if you wish), 22 (we showed in class that $\mathbb{R}$ is *separable).*

**Assignment 5,** Book Problems: Due Oct 17

Chapter 1, # 11; Chapter 2, # 8, 13, 14.

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**Special Problem 2:** Due Oct 17

Problems (37) and (38) in the Inductive Sets notes. You may use Special Problem 3's result.

**Assignment 4,** Book Problems: Due Oct 10

Chapter 1, # 7efg; Chapter 2, # 11.

**Special Problem 3:** Due Oct 10

Problem (39) in the Inductive Sets notes.

**Assignment 3,** Book Problems: Due Oct 3

Chapter 1, # 7cd; Chapter 2, # 6, 7, 9.

**Assignment 2,** Book Problems: Due Sept 26

Chapter 1, # 6cd, 7ab; Chapter 2, # 2, 5.

**Assignment 1,** Book Problems: Due Sept 19

Chapter 1, # 2, 3, 6ab, 8, 10.

**Special Problem 1:** Due Sept 14

Use the Completeness Axiom to prove that the set $\mathbb{N}$ of natural numbers (as defined using Inductive Sets) is not bounded above.