Math 4606, Summer 2001 **Assignments**

Assignments are due at the start of class on the given Due date.

Please Note! *Special problems are like "term papers." They must be well-written, on standard 8.5 x 11 paper, and must be succint - with exactly enough detail.*

Paper torn from spiral notebooks is not acceptable.
Err in the direction of slightly excessive detail at first,
but prolixity is not acceptable.

Special Problem 7: Due Aug 2

Course evaluation: fill out the evaluation form, and turn it in to the designated collector, who will keep a list of those who turned in a form.

Special Problem 6: Due Aug 1

Let $S \subseteq \mathbb{R}^n$ be a nonempty set such that every sequence of points in S has a limit point in S. Prove that S is compact. Hint: Easy, but do not assume what you are trying to prove! Avoid circular arguments!

Assignment 6, Book Problems: Due July 31

Section 2.6, # 1(b)(c); Section 3.2, # 4; Section 3.3, # 3(a)(c).

Special Problem 5: Due July 26

Let $p \in \mathbb{Z}^+$, with $p > 1$. For $A > 0$ we define $x_1 := A + 1$ and for $n \in \mathbb{Z}^+$ we define $x_{n+1} := \frac{1}{p}\left((p-1)x_n + \frac{A}{x_n^{p-1}}\right)$. Prove that $\{x_n\}$ is strictly decreasing and that $x_n^p > A$ for all $n \in \mathbb{Z}^+$. Prove that there exists $L > 0$ such that $L^p = A$. You may need to state and prove certain properties of limits.

Assignment 5, Book Problems: Due July 24

Section 1.8, # 8; Section 2.2, # 1, 2, 6.

Assignment 4, Book Problems: Due July 17

Section 1.6, # 15; Section 1.8, # 1, 2, 3.

Assignment 3, Book Problems: Due July 9

Section 1.6, # 29, 30; Section 1.7, # 10; Section 5.5, # 17 (Hint: Let $x_1=\sqrt{2}$, and let $x_{n+1}=\sqrt{2+x_n}$).

Special Problem 4: Due July 10

This is a double-credit Special Problem! To begin we define, for each $n \in \mathbb{N}$,

$$F_n := \{k \in \mathbb{N} : k < n\}.$$

In particular, $F_0 = \emptyset$. Prove that, for all $m \in \mathbb{N}$, for all $n \in \mathbb{N}$, there exists a one-to-one-correspondence $h : F_m \to F_n$ if and only if $m = n > 0$. This is a challenging Problem; it is designed to "force" you to ask questions!

Assignment 2, Book Problems: Due June 29

Section 1.6, # 9(The Squeeze Theorem), 18, 26abc, 28.

Special Problem 3: Due June 26

In class we proved that if E is a closed set then E contains all of its boundary points.

Suppose that if $E \subseteq \mathbb{R}^n$ and that every $y \in \mathbb{R}^n$ that is a boundary point for E is in E.

Prove that E is a closed set.

In other words, in this Special Problem you will prove that if a set E contains all of its boundary points then E is a closed set.

Assignment 1, Book Problems: Due June 22

Section 1.3, # 1 –3, 5.

Special Problem 2: Due June 19

Write Axiom **O**(i) "in Logic." Shortest expressions may be awarded extra credit.

Special Problem 1: Due June 14

Prove that, if a, b, A, B are all positive, then

$$\min\left\{\frac{a}{A}, \frac{b}{B}\right\} \leq \frac{a+b}{A+B} \leq \max\left\{\frac{a}{A}, \frac{b}{B}\right\} \quad \text{(cf. 1.2, \# 21)}.$$