Math 4606, Summer 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 untrimmed 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. Using lined paper and writing on both sides of a page are both acceptable.

You must acknowledge the help you receive from others! If an answer looks a lot like like someone else's, and the connection is not mentioned, I'll give zero points to the ones that follow the first one read! The same goes for answers that appear to be copied from a book: the book gets the points! If this happens to you, see me about it at once.

Assignment "7", "Book" Problems: Due at no time

(1) Exercise #1 in each §**19.x** except for **.11, .31, .5**
(2) §**19.31** # 3
(3) §**19.4** #2, #3, # 5
(4) §**20.1** #1, # 6
(5) §**20.2** #1, # 3
(6) §**20.3** # 3

Special Problem 7: Due August 3

§**20.1** #4.

Special Problem 6: Due July 29

§**8.2** #5.

Assignment 6, "Book" Problems: Due August 1

(1) §**12.8** #6, (2) §**12.8** #7, (3) §**12.8** #8, assuming G is an open ball, (4) §**12.8** #11, (5) §**12.8** #14.

Special Problem 5: Due July 26

Suppose that $M = (a_{ij})$ is an $m \times n$ matrix with real entries. Let $A := \sqrt{\sum_{ij} a_{ij}^2}$. What are the ranges of the subscripts i and j? Prove that $\|Mx\| \leq A\|x\|$ for all x in $\mathbb{R}^{?}$. Which norm is applied to Mx? justify your answers. Briefly.

Assignment 5, "Book" Problems: Due July 25

(1) §**6.4** #3, (2) §**6.5** #1, (3) §**6.5** #2, (4) §**6.52** #7, (5) §**6.52** #9.

Special Problem 4: Due July 20

§**5.2** #11 **and** #12. Prove your answers. You need to use Definitions as well as Theorems and algebraic manipulations, as tools for your intuition.

Assignment 4, "Book" Problems: Due July 18

(1) §**4.5** #1, (2) §**4.5** #3, (3) §**4.5** #4, (4) §**4.Miscellanious (p 114),** #7, (5) §**5.2** #8.

Assignment 3, "Book" Problems: Due July 11

(1) **(corrected!)** Prove that if $f(x)$ is known to be differentiable when $x \neq 0$ and $L := \lim_{x \to 0} f'(x)$ exists, **and** $f(x)$ **is continuous at** $x = 0$, then $f'(0)$ exists and $f'(0) = L$.
(2) Write out Taylor's formula for $f(x) = \dfrac{1}{1+x^2}$ when $a = 0$ and $n = 2$. Justify your answer.
(3) Suppose that $\lim_{x \to 0} f(x) = 0 = \lim_{x \to 0} g(x)$ and $g'(x) \neq 0$ if $0 < |x| < 1$ and $L := \lim_{x \to 0} \dfrac{f'(x)}{g'(x)}$ exists. Use the Cauchy Mean Value Theorem to show that $\lim_{x \to 0} \dfrac{f(x)}{g(x)} = L$.
(4) For *arbitrary* positive integers n write out the Taylor formula

for $f(x) := \dfrac{1}{1-x}$ when $a = 0$. Justify your answer.

Special Problem 3: Due July 8

See §**2.8** #10: Answer the "why?" question in the first ¶, then use the first ¶ to show that for all $A > 0$ there is a *unique* positive solution c of the equation $c^2 = A$. For *double* credit, show that for all $A > 0$ and for all positive integers n that there is a *unique* positive solution c of the equation $c^n = A$. Induction won't work!

Assignment 2, "Book" Problems: Due July 5

(1) §**2.8** #7, (2) §**2.8** #8, (3) §**3.0** #2, (4) §**3.0** #4, (5) §**3.1** #4.

Special Problem 2: Due June 24

Solve exactly one of the following problems (1), (2); i.e., turn in exactly one solution:
(1) Prove that for all $x_1 \in \mathbb{N}$ and for all $x_2 \in \mathbb{N}$, $x_1 + x_2 \in \mathbb{N}$ and $x_1 \cdot x_2 \in \mathbb{N}$.
(2) Prove that for all $x_1 \in \mathbb{N}$ and for all $x_2 \in \mathbb{N}$, $|x_1 - x_2| \in \mathbb{N}$.

Assignment 1, "Book" Problems: Due June 27

In this assignment, your proofs have to be "axiomatic!"

(1) §**2.2** #1, (2) §**2.2** #2, (3) Prove that if x is in a *field* $\mathcal{F}$ then $x^2 = 1 \iff [x = 1 \text{ or } x = -1]$.
(4) Prove that if n is an odd integer, then n^2 is an odd integer.
(5) Prove that if n^2 is an even integer then n is an even integer.
(6) §**2.5** #1. Be sure you *prove* the "fact" the last sentence tells you to use!
(7) Prove **(2.2-9)**.

Special Problem 1: Due June 16

Write out the Truth Tables for the statements "Exactly two of A, B and C are true" and "At most two of A, B and C are true."