Math 4606, Summer 2002 **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, in ink, 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.

Assignment 8, Book Problems: Due Aug 5??

Section 8.1, # 16; Section 8.2, # 12, 16; Section 8.4, # 12. Study problems: 8.3 # 1 – 12; 8.3 # 1 – 21.

Special Problem 4: Due Aug 2

For vectors x and y in $\mathbb{R}^n$, prove that
(a) $|x+y|^2 + |x-y|^2 = 2|x|^2 + 2|y|^2$. Assume that neither of x and y is zero, and that neither one is a multiple of the other. Find the sum of the squares of lengths of the diagonals of the parallelogram determined by x and y, in terms of the squares of the lengths of the edges of the parallelogram. Note that, even tho this problem is stated for $\mathbb{R}^n$, the parallelogram determined by x and y lies in a plane (in the ordinary sense).
(b) $x \bullet y = \frac{1}{4}(|x+y|^2 - |x-y|^2)$ (the *Polarization Identity).* Two vectors x and y in $\mathbb{R}^n$ are *orthogonal* if $x \bullet y = 0$. This is written "$x \perp y$". Prove that if neither of x and y is zero and $x \perp y$ then whenever A and B are constants that are not both zero, $\dfrac{|Ax+By|}{|Ax-By|} = 1$. Measurements often measure energy of some kind, which is often expressible as the square of a norm that arises from a (probably generalized) dot product. The Polarization Identity thus allows us to find the inner product of two vectors x and y if we know the lengths of $x+y$ and $x-y$.

Assignment 7, Book Problems: Due July 31

Section 4.1, # 9, 13; Section 7.3, # 3, 8.

Assignment 6, Book Problems: Due July 24

Section 3.7, # 6, 7, 13, 14; Section 4.1, # 3.

Special Problem 3: Due July 19

Section 3.1, # 5. What Protter calls "increasing" is what we call "strictly increasing." Show also that the function

$$s(x) := \begin{cases} 2x, & \text{for } 0 \le x < 1/2; \\ 2x-1, & \text{for } 1/2 \le x \le 1 \end{cases}$$

has the intermediate -value property on $[0, 1]$, but is not continuous on $[0, 1]$.

Assignment 5, Book Problems: Due July 17

Section 3.1, # 2, 3; Section 3.2, # 14; Section 3.3, # 8; Section 3.5, # 7.

Assignment 4, Book Problems: Due July 10

Section 2.4, # 8, 11; Section 2.5, # 6, 8.

Special Problem 2: Due July 8

Prove that the sequence defined by $x_0 = 1$ and $x_{n+1} = \sqrt{3+2x_n}$ exists and converges. Find the limit.

Assignment 3, Book Problems: Due July 3

Section 1.3, # 8, 18; Section 1.4, # 6; Section 2.1, # 6; Section 2.3, # 6.

Assignment 2, Book Problems: Due June 26

Math 4606, Summer 2002 **Assignments**

Section 1.1, # 7, 8, 10; Section 1.2, # 10; Section 1.3, # 16, 17; Prove that for all real x, $-x = (-1)x$.

Assignment 1, Book Problems: Due June 20

Section 1.1, # 1 – 4. (numbers 1 and 2 are not clearly stated; ask!)

Special Problem 1: Due June 24

Section 1.2, # 6, 8.

On the set $\{0, 1\}$ we define addition and multiplication by the following tables:

$+$	0	1
0	0	1
1	1	0

$\times$	0	1
0	0	0
1	0	1