Math 8801, Fall 2005 **Assignments** are due at the start of class on the Due date

Assignments are due at the start of class on the due date. Further Problems may be scored competitively! Neatness, legibility and cogency count! Give credit for help received, including books and hints from me and others; mention discussions. If a Further Problem is difficult, please include a "narrative" that tells what you went thru to reach your results. Further Problems should be written on standard size paper, and spiral-bound paper must be trimmed! There should be one-inch margins all around (name and problem number in the top margin are OK). Lined paper is fine, and using both sides is fine too. But if your handwriting fills up lines, double-space!

Assignment 5, Book Problems: Due Dec 19

Chapter 3, # 2, 4, 7, 11, 24, 26; Chapter 4, # 1.

Assignment 4, Book Problems: Due Nov 16

Chapter 1, # 15, 19, 21; Chapter 2, # 4, 6, 13, 14.

Assignment 3, Book Problems: Due Oct 28

Chapter 1, # 8, 11, 13ade, 14abc, 17(but for the Schwartz space).

Further Problem 3: Due Oct 17

Show that the metric $d(x, y)$ defined in (1) on page 29 (in 1.38(c)) gives the same topology as the metric

$$\sigma(x, y) := \sum_{n=1}^{\infty} \frac{1}{2^n} \frac{p_n(x-y)}{1+p_n(x-y)}$$ (my hint in class turns out to be food for thought but not useful).

Assignment 2, Book Problems: Due Oct 7

Chapter 1, # 7, 9, 10, 12, 13bc, 22.

Further Problem 2: Due Oct 3

Verify that $\mathbb{R}^{\mathbb{N}}$ is a topological vector space with the definition of neighborhoods of zero we devised in class. Find all continuous linear functionals $\Lambda : \mathbb{R}^{\mathbb{N}} \to \mathbb{R}$. That is, identify the dual space of $\mathbb{R}^{\mathbb{N}}$.

Further Problem 1: Due Sept 19

Find a simple necessary and sufficient condition, on sets in a vector space V, that $A + A = 2A$, and deduce that a convex set C satisfies $C + C = 2C$. *Must* a set A such that $A + A = 2A$ be convex? What if we add the condition that the intersection $A \cap L$ of any line $L = L(p, q)$ in X be closed in $\mathbb{R}$? Note: by "a line L in V" we mean a set L, determined by distinct vectors p and q, and given by $L(p, q) := \{(1-t)p + tq : t \in \mathbb{R}\}$. Then $A \cap L(p, q)$ determines the set in $\mathbb{R}$ given by $\{t \in \mathbb{R} : (1-t)p + tq \in A\}$, and this is the set that we will always require to be closed in the added condition.

Assignment 1, Book Problems: Due Sept. 21

from *Hilbert Space Notes:*
(1) Prove that the "norm" defined in **8** *is* a norm; (2) Prove **17**; (3) Problem **33**; (4) Problem **35**.