

**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 14,** Book Problems: Due May never

Chapter 5, # 8, 13; Chapter 6, # 9, 15(Heisenberg Uncertainty!); Chapter 7, # 15, 18; Chapter 8, # 6, 7; Chapter 9, # 13, 20, 24. Browse as many of the problems as you can.

**Assignment 13,** Book Problems: Due May 1

Chapter 9, # 16, 17, 19, 21, 28.

**Special Problem 7:** Due Apr 26

Find a formula (in terms of its entries) for  $\left\| \begin{pmatrix} a & b \\ c & d \end{pmatrix} \right\|$ , where the entries are *real* numbers. Use no eigenvalues!

**Assignment 12,** Book Problems: Due Apr 24

Chapter 9, # 7, 14a, 14d, 27.

**Assignment 11,** Book Problems: Due Apr 17

Chapter 7, # 20, 21, 24; Chapter 9, # 8.

**Special Problem 6:** Due Apr 12

This is a twenty-point Special Problem! Chapter 7, # 13.

**Assignment 10,** Book Problems: Due Apr 10

None; work on Special Problem 6!

**Assignment 9,** Book Problems: Due Apr 3

Chapter 7, # 4, 9, 11, 12.

**Assignment 8,** Book Problems: Due Mar 27

Chapter 7, # 1, 3, 6, 7.

**Special Problem OP2:** Due Apr 19

Prove Theorem 2 in the Appendix to Section 6 of the Riemann-Stieltjes notes.

**Special Problem OP1:** Due Apr 5

Problem 2, page 2, in Section 6 of the Riemann-Stieltjes notes.

**Special Problem 5:** Due Mar 24

Suppose that  $\{f_{nm}\}$  is a double sequence of complex numbers,  $n \geq 1$ ,  $m \geq 1$  and that  $\{g_m\}$  is a sequence of non-negative numbers.

In addition suppose that

$$\begin{cases} \text{(i)} & \sum_{m=1}^{\infty} |f_{nm}| < \infty & \text{for each } n, \\ \text{(ii)} & f_m := \lim_{n \rightarrow \infty} f_{nm} & \text{exists for each } m, \\ \text{(iii)} & \sum_{m=1}^{\infty} g_m < \infty, \\ \text{(iv)} & |f_{nm}| \leq g_m & \text{for all } n \text{ and } m. \end{cases}$$

- (a) Prove that  $\sum_{m=1}^{\infty} |f_m| < \infty$  and  $\lim_{n \rightarrow \infty} \sum_{m=1}^{\infty} f_{nm} = \sum_{m=1}^{\infty} f_m$ .
- (b) Show that without (iii) and (iv), (a) need not hold, even if  $f_m = 0$  for all  $m$ .
- (c) Show that if  $\sum_{m=1}^{\infty} |f_m| < \infty$  then  $h(\theta) := \sum_{m=1}^{\infty} f_m e^{im\theta}$  is a continuous function of  $\theta \in \mathbb{R}$ .

**Note:** Please don't bother copying the problem statement in your solution!

**Assignment 7**, Book Problems: Due Mar 20

Chapter 6, # 10c (with  $\alpha(x) = x$ ), 15, 18.

**Special Problem 4:** Due Mar 8

How “should” we define  $BV[0, +\infty)$ ? The problem is, what do we use as a substitute for a “partition” of  $[0, +\infty)$ ? Is  $\frac{\sin x}{x}$  in  $BV[0, +\infty)$ ? What about  $\frac{\sin^2 x}{x^2}$ ? Why?

**Assignment 6**, Book Problems: Due Mar 6

Chapter 6, # 5, 6, 7, 10ab (with  $\alpha(x) = x$ ); use Calculus!

**Assignment 5**, Book Problems: Due Feb 27

Chapter 5, # 14, 16, 22; Chapter 6, # 1, 2.

**Assignment 4**, Book Problems: Due Feb 20

None, but Assignment 5 will be a little longer.

**Special Problem 3:** Due Feb 24

Chapter 5, # 27. Be sure to do the part that *seems* to be part of the *Hint*, but isn't.

**Special Problem 2:** Due Feb 17

Chapter 5, # 26. Be sure to verify that  $M_1 < \infty$ .

**Assignment 3**, Book Problems: Due Feb 13

Chapter 5, # 2, 6, 8, 11.

**Special Problem 1:** Due Feb 10

Chapter 5, # 10. Be sure to do the comparison with **5.18**.

**Assignment 2**, Book Problems: Due Feb 6

Chapter 5, # 3, 4, 7, 9; Chapter 9, # 9, with “*connected* open set  $E \subseteq \mathbb{R}^n$ ” replaced by “non-empty open ball  $E \subseteq \mathbb{R}^n$ ”.

**Assignment 1**, Book Problems: Due Jan 30

Chapter 4, # 17, 19, 23, 24; Chapter 5, # 1, 5.