for Tuesday, January 17

1. Read the introduction to Chapter 5, then read Section 5.1 through the example following Definition 5.4. Pay particular attention to notation and do what it takes to understand this somewhat messy notation for a simple idea.
2. Do problems 1–5 in Section 5.1. Check your numerical answers with other students. I will not be collecting any of these problems.

for Thursday, January 19

1. Finish reading Section 5.1 and work on problems 6–17.
2. Turn in solutions to problems 10 (the x^2 example in class should help), 11b (this is standard stuff—word it carefully), and 15a (this is similar to the example in the text) from Section 5.1.

for Monday, January 23

1. Read Section 5.2 through the proof of Lemma 5.9.
2. Be prepared to discuss problems 18–21 from Section 5.1 and problems 1–5 in Section 5.2.
3. Turn in solutions for problem 20 from Section 5.1 and problem 2 from Section 5.2.

for Tuesday, January 24

1. Finish reading Section 5.2; plan on 60 to 90 minutes for this.
2. Be prepared to discuss problems 7, 8, and 10 from Section 5.2. I will not be collecting any of these.

for Thursday, January 26

1. Go over Sections 5.1 and 5.2 to solidify your understanding of the integral concept.
2. Work on problems 11, 12, 13, and 20 from Section 5.2. Think hard about approaches to problem 20.
3. Turn in solutions for problems 14 and 19 in Section 5.2. Treat this as the first no help assignment of the semester; I am sure you remember the guidelines for these types of assignments. For problem 14, it is only part (a) that requires much effort and it follows pretty quickly from part (b) of problem 5.1.19 that we did in class. For problem 19, I suggest you use the definition of the Riemann integral; you should be able to easily guess the value of the integral.

for Monday, January 30

1. Read Section 5.3 carefully.
2. Look over all of the exercises for Section 5.3, determining those that you know how to start and those that seem intractable at this point in time. Solve some of the computational problems and outline proofs for some of the theoretical ones.
3. Turn in solutions for problems 10 and 13 from Section 5.3. You may not use the FTC to solve problem 10. For problem 13, you may (as indicated) use the result from problem 12.

for Tuesday, January 31

1. Continue working on the exercises in Section 5.3. Focus your attention on problems 1, 5, 6, 11, 14, and 19. I will not be collecting any problems but will expect you to have some solutions for class discussion.

for Thursday, February 2

1. Read the portion of Section 5.4 that starts in the middle of page 185 and ends in the middle of page 187, that is, read about composition, average value, and mean value theorems.
2. Be prepared to discuss problems 9, 10, 11, 12, and 14 in Section 5.4.
3. Turn in solutions for problem 18 in Section 5.2 and problem 18 in Section 5.6. Treat this as the second no help assignment of the semester; I am sure you remember the guidelines for these types of assignments. For problem 5.2.18, you may use Corollary 5.16 (which you probably would have used without thinking much about it anyway). Problem 18 is actually elementary once you recognize what needs to be done. The key issue is that the points s_i and t_i are different points (tags) in the subinterval.

for Monday, February 6

1. Read the first part of Section 5.4 through the paragraph following the proof of Theorem 5.21.
2. Be prepared to discuss problems 1–5 in Section 5.4. Think carefully about problem 3 and how you would prove it directly, without recourse to part (b) of the theorem. Problem 5 is the sort of problem I want you to learn to grasp so think about an outline for the proof; you should rely on previous results.
3. Turn in solutions for problem 6 in Section 5.4 and problems 4 and 11 in Section 5.6.

for Tuesday, February 7

1. Read the last part of Section 5.4 concerning step functions.
2. Be prepared to discuss problems 18–25 in Section 5.4. I will not be collecting any of these problems but would like to have a class discussion about them.

for Thursday, February 9

1. Read the remark preceding problems 45–57 in Section 5.6 concerning sets of measure zero and ponder problems 45–50.
2. Turn in solutions for problems 1, 3, and 8 in Section 5.6. Treat this as our third no help assignment of the semester by following the appropriate guidelines for these types of assignments. Problem 1 should look familiar. For problem 3, note that f need not be continuous or monotone, and that F' may not exist at some points. Do not forget to give a clear example for problem 8.

for Monday, February 13

1. Review Sections 5.1 through 5.4 as necessary. Keep the ideas fresh in your mind and identify any gaps in your understanding.
2. Be prepared to discuss the applied problems 15 and 16 in Section 5.6. This may be a good review of one part of Calculus II.
3. Turn in solutions for problems 12 (use some knowledge from differential equations but also think about the relevant ideas in Chapter 5) and 53 in Section 5.6.

for Tuesday, February 14

1. Read Sections 6.1 and 6.2, including reading the exercises. Come to class with any questions you have on this review material.

for Thursday, February 16

1. Read Sections 6.3 and 6.4.
2. Work on problems 3, 6, 8, 10, 13 (consider $p = 5$ only), 14, 15, 16, and 17 in Section 6.4.
3. Turn in solutions for problems 13 (with $p = 5$) and 15 in Section 6.4.

for Tuesday, February 21

1. Review Chapters 5 and 6, omitting Section 5.5. Be familiar with basic concepts and results. Learn the items mentioned on the review sheet.
2. Work on problems 2, 20, and 33 in Section 5.6 and problems 10a (find the sum also), 10b, 13, 15, 19, 24 ,and 28 in Section 6.5. Also look at problem 6.3.20.
3. Turn in solutions for problem 5.6.2 and problem 6.5.10a (including finding the sum of the series).

for Thursday, February 23

1. We have a test on the portions of Chapters 5 and 6 that we have covered thus far during the semester.

for Monday, February 27

1. Read Section 7.1. Study the examples very carefully and do your best to understand this new abstract concept.
2. Work on problems 1, 2, 3, 5, 6, 8, 13, 14, 15b, 15c, and 16 in Section 7.1. I will not be collecting any of these but we will discuss some of them in class.

for Tuesday, February 28

1. Read Section 7.2. Uniform convergence is a very important topic in real analysis.
2. Work on problems 4, 5, 7, 10, 11, and 12 in Section 7.2.
3. Turn in solutions for problems 4c and 10 in Section 7.2.

for Thursday, March 1

1. Read Section 7.3.
2. Work on problems 1, 3, 5, 9, 11, and 18 in Section 7.3.
3. Turn in solutions for problems 1 and 5b in Section 7.3.

for Monday, March 5

1. Read Section 7.4. This section should be a review of Calculus II.
2. Work on problems 1, 2, 4, 5, 13, 14, 15, 16, 17, 19, 20, and 23 in Section 7.4. This set of problems focuses on the types of problems you would expect to see in a calculus class. Note that problem 23 gives you a different approach to the Fibonacci sequence.
3. Turn in solutions for problems 15, 19, and 20 in Section 7.4.

for Tuesday, March 6

1. Read Section 7.5.
2. Work on problems 3a, 3b, 3e, 3f, 3g, 5, 6, 7, 8, 10, 12, and 14 in Section 7.5. You will find that most of these problems are computational in nature.
3. Turn in solutions for problems 3g, 7b, and 8. Note that one way to prove that a sequence converges to 0 is to prove that its corresponding series converges.

for Thursday, March 8

1. Read Section 7.6, starting with the paragraph that begins on page 277. Do your best to make sense of the proofs for these two important results in analysis.
2. Turn in solutions for problems 11, 15, and 24 in Section 7.7. Treat this as our fourth no help assignment of the semester by following the appropriate guidelines for these types of assignments. These problems are not as scary as they might seem at first but it does take a while to unravel what it going on. For problem 15, recall that $x^x = \exp(x \ln x)$.

for Monday, March 26

1. Read Sections 7.1 and 7.2. Become familiar with as many examples as you can and make certain you understand the definitions and relevant theorems.
2. Do problems 11, 12, 14, and 15 in Section 7.2.
3. Turn in a solution to problem 15 from Section 7.2, giving a careful proof for each part.

for Tuesday, March 27

1. Read Section 7.3 and be familiar with the proofs of these results.
2. Do problems 5, 6, 7, 9b, and 16 in Section 7.3.
3. Discuss the following problems from Section 7.3 at the board: Mollee (5a), Robin (5c), Price (7), David (9b), Matt (16c), and Allison (16b).

for Thursday, March 29

1. Read Sections 7.4 and 7.5. Since you have now seen these ideas several times in at least two courses, you should begin to develop a deeper understanding of power series.
2. Do problem 23 in Section 7.4. Also, find the sums of the series in problems 1b and 2b in Section 7.4; you may use results from later sections if necessary. Do problems 5, 13, 14, and 19 in Section 7.5.
3. Turn in a solution to problem 14 in Section 7.5, giving a careful proof for each part.

for Monday, April 2

1. Read Section 7.6. You have already read the second half of this section so spend more time on the first few results. However, make certain you can fill in the computational details lurking in the proofs of the last two results.
2. Work on problems 1, 3, 6, 7, 9, 14, 22, and 24abc in Section 7.6.
3. Turn in solutions for problems 3 and 22 in Section 7.6.

for Tuesday, April 3

1. Look back over Chapter 7 and bring in any questions that you have. Consider problems 6, 8, and 45 in Section 7.7.

for Thursday, April 5

1. Turn in solutions for problems 16 and 33 in Section 7.7 (due at the beginning of class). Treat this as our fifth no help assignment of the semester by following the appropriate guidelines for these types of assignments. Since each of these two problems (valued at 20 points apiece) involves several parts, if you get stuck on one part, you may assume that result and use it to prove later parts if necessary. Much of problem 16 is elementary but part (b) is not. For this part, you may use the following result.

    Suppose that $\{s_n\}$ is a sequence of functions that converges uniformly to a function s on some interval I and that $c \in I$. If $\lim_{x \to c^+} s_n(x) = v_n$ for each $n \in \mathbb{Z}^+$, then the sequence $\{v_n\}$ converges and $\lim_{x \to c^+} s(x) = \lim_{n \to \infty} v_n$. (A similar result holds for left-hand limits.)

    You do not need to include a proof of this result here but you should be able to do so (say on an exam). For problem 33, you will need to think a little out of the box for your use of the Mean Value Theorem; this theorem is valid for any differentiable function, not just one that looks like f_n.

for Monday, April 9

1. We will begin thinking about metric spaces this week. As a start, read Section 8.5 through the statement of Theorem 8.46. Be certain to understand the various metric spaces that are introduced.
2. Work on problems 1d, 4, 7, 8, 9, 10h, 11, 12, 13, and 16 in Section 8.5. Some of these should go very quickly but others may give you pause. Bring in any questions that you have.
3. Turn in solutions for problems 14 and 15 in Section 8.5.

for Tuesday, April 10

1. There is no class meeting today because of the undergraduate conference. Do attend some of the talks presented by your peers, trying at least one talk outside of your comfort zone.

for Thursday, April 12

1. Extend your reading of Section 8.5 to Theorem 8.51. You might find it helpful to do some reading in Section 8.1 as well to see these concepts in the familiar context of $\mathbb{R}$.
2. Work on problems 21–32 and 18 in Section 8.5. Once again, you should find that some of these problems are quite easy.
3. Turn in solutions for problems 29 and 32 in Section 8.5.

for Monday, April 16

1. Read Section 8.2 carefully and spend some time meditating on the concept of compact set. Pay particular attention to the proof of the Heine-Borel Theorem. As far as Section 8.5 is concerned, you should be up through Theorem 8.53 in your reading.
2. Be prepared to discuss problems 1, 2, 3, 6, and 9 in Section 8.2 and problems 36, 38, and 40 in Section 8.5. Be certain to think enough about these problems so that you could present your thoughts on them to the class if called upon.
3. Turn in solutions to problem 9 in Section 8.2 and the following three problems from Section 8.5.
   i. Prove that $(A \cup B)' = A' \cup B'$. There are two set inclusions to establish here and one of them may be easiest with an indirect proof.
   ii. Prove that E' is a closed set. We mentioned in class what is necessary here.
   iii. Use (i) and (ii) to prove that $\overline{E}$ is a closed set.

for Tuesday, April 17

1. We will discuss any homework or reading questions that have not yet been addressed and summarize the key ideas from Chapter 7 and part of Chapter 8.

for Thursday, April 19

1. We have a test on Chapter 7 and the parts of Chapter 8 that we have discussed thus far. The test will consist of four in-class problems and two take-home problems (that have the same guidelines as the special assignments and will be due on Monday). To be prepared for the in-class portion of the test, be familiar with the basic ideas and techniques that we have studied thus far. I realize that this is rather wide open but if you have grasped the key results and methods, you should find that the test problems are well within your reach.

for Monday, April 23

1. The take-home portion of the test is due at the beginning of class.
2. As time permits, look over Sections 8.1 and 8.2 and bring in any questions you have on the ideas presented in these two sections.

for Tuesday, April 24

1. Read Section 8.3 through the bottom of page 310. Work on problems 1, 2, 6, 12, 14, and 16. Be prepared to discuss these problems in class.
2. Turn in a solution for problem 6 in Section 8.3.

for Thursday, April 26

1. Continue reading Section 8.3 through the proof of Theorem 8.24.
2. Work on problems 21 and 34 in Section 8.3 and problems 21, 22 and 23 in Section 8.2.
3. Turn in solutions for problem 34 in Section 8.3 and problem 21 in Section 8.2.

for Monday, April 30

1. Read Section 8.4 beginning with the discussion of perfect sets. I suggest you spend about an hour thinking about this material. I would also like you to read and ponder briefly problems 58, 59, and 63 in Section 8.5.
2. Work on problems 27, 29, 30, and 32 in Section 8.4 and problems 52, 54, 62, and 85 in Section 8.5. Except for problems 27 and 85, these problems should go rather quickly.
3. Turn in solutions for problem 27 in Section 8.4 and the (2) implies (3) portion of problem 85 in Section 8.5. You will need to use some properties of induced set functions for problem 85.

for Tuesday, May 1

1. Record any remaining questions you have on the reading from Section 8.4 and reread problems 58, 59, and 63 in Section 8.5. Our next goal will be the proofs of these lengthy problems.
2. Work on problems 34, 35, 36, and 37 in Section 8.4.
3. Turn in a solution for problem 34c in Section 8.4. If you use Theorem 8.39, you should find that the proof falls out rather quickly.

for Thursday, May 3

1. Continue thinking about the problems that appear in problems 58, 59, and 63 in Section 8.5.
2. Turn in a solution to part (b) of problem 63 in Section 8.5. Given an $\epsilon > 0$, we are looking for one δ that works for all of the functions in K. If you start with an open cover of K using ϵ-balls and take a finite subcover, you should be able to find the δ that you need. The proof itself is rather elementary; the difficulty may lie in the abstraction of the metric space.

for Monday, May 7

1. I will fill this in, along with the other gaps, later.
2. The following three problems will constitute our sixth and final no help assignment of the semester; be certain to follow the appropriate guidelines for these types of assignments. This assignment is due at the beginning of class on this date (May 7). The first problem is Exercise 38 in Section 8.4. Once you understand the basic ideas and definitions, this problem should not be too difficult. The second problem is Exercise 43 in Section 8.5; you may use properties of metric spaces that have appeared prior to this exercise if you find them helpful. The third exercise requires a new definition; you are to prove the theorem that appears after the definition. I suggest you study the proof of the Heine-Borel Theorem.

Definition: Let $\delta(\cdot)$ be a positive function defined on the interval $[a, b]$. A δ-fine tagged partition of $[a, b]$ is a tagged partition ${}^{t}P = \{(t_i, [x_{i-1}, x_i]) : 1 \leq i \leq n\}$ of $[a, b]$ such that $[x_{i-1}, x_i] \subseteq \big(t_i - \delta(t_i), t_i + \delta(t_i)\big)$ for each $1 \leq i \leq n$.

Theorem: If δ is a positive function defined on $[a, b]$, then there exists a δ-fine tagged partition of $[a, b]$.

for Monday, May 7

1.
2.

for Tuesday, May 8

1.
2.