Some Keys to Success

Real Analysis I
MATH 446

In this course, most of our time will be spent on understanding and using the mathematical structure of the topics given in the catalog description. Because of this, learning to employ logic and mathematical reasoning is of utmost importance. Often the best way to learn this is through practice, and this practicing needs to permeate the semester. “Cramming” does not usually lead to a meaningful course nor a deep understanding. Below are a few suggestions:

- Start the homework early!
- Start a “Dictionary/Results/Techniques/Examples” notebook. I recommend using a three-ring binder. With each new topic, start a separate page writing the topic at the top and start collecting the definitions/notation, results, techniques, and examples related to the topic. This becomes a useful reference for homework and studying for exams.
- Start the homework early! Learning advanced mathematics is in many ways learning a new way of thinking and often the best way to see and master the level of abstraction is by working through problems. Attacking homework may be different in this course than in others you have had before. Because of this, it is important to start the homework early as you may need some saturation time to grasp the material and are likely to need multiple attempts to complete some problems. Starting the homework early also gives you time to ask questions as you are moving through this learning process.

Things to try when doing homework include:

- Review the book and course notes.
- Read the problem!
- If you are asked to prove/show/justify (which are all synonyms!):
  - Write the hypotheses at the top of the page and the conclusions at the end.
  - List results and definitions relating to the terms in the hypotheses and the conclusion even if a connection does not immediately seem apparent. This is where the notebook mentioned above can come in handy. Try to connect a chain of results to get you to the conclusion. Try working from the conclusions up to the hypotheses.
  - Write out the contrapositive – maybe this will be “easier” to prove based on what results have at your disposal.
  - Draw a picture or try a specific example of a general statement to see how steps of a proof of the general statement might look, but remember examples and pictures are not the same as a proof.

This should help you to start thinking about a problem and can often lead you to an outline of a solution/proof. You will take wrong turns while solving problems and trying to make arguments and that in itself can be a learning experience! This happens to mathematicians frequently as we try to prove new results. Of course, you should also utilize office hours to ask questions about any one of the steps suggested above.
– *Once you have a solution, rewrite your work to be graded in a clear and logical way.* The process to get a correct proof is often not as linear as one might hope, but the write up should present a clear, precise, and logical argument!

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Below are the homework expectations and permissable resource and collaboration information copied from the syllabus for easy reference.

**Homework expectations:** Working diligently and frequently is a key to success in this course. Because the process of applying reasoning to solve problems and communicating arguments is fundamental to this course, unsupported answers and arguments may receive no credit. To facilitate this process, the following requirements are made of the written graded homework.

- Problems should be clearly labeled and numbered on the left side of the page and written in the order they are assigned. There should also be a visible separation between problems, and you should leave the *left margin and the back of every page blank* so that the space may be used for scoring and comments.

- Because there is a difference between “scratch work” and your final solution/argument, cross outs and excessive eraser marks should not be found throughout your work.

- Use complete sentences when communicating an argument/proof, and of course, proofs should be written in paragraphs with calculations/equations and diagrams centered as needed. Look to your text for examples of appropriate mathematical writing. The proofs are not strewn with symbols nor are they in a two-column format!

- You must *always* indicate with whom you worked on each problem. Simply write the name of your collaborators to the left of the problem number in the margin. This is the exception to leaving the left margin blank!

- Staple all pages together before class and remove “rough” edges.

One last tip that isn’t required: Beginning each solution/proof with the original problem statement makes it easier to study from your work later and allows me to address different aspects of the problems in my comments to you when needed.

**Permissable Resources and Collaboration:** Resources acceptable for use are your or a current classmate’s personal course notes, documents distributed by me during this semester, and the required textbook. You may only consult with other members of this class and with me on the graded assignments. Moreover, you should not turn in work that you did not contribute to substantially. A good measure for this is whether you could explain the solution in your own words or explain if called on in class, and so it is best to write your solutions independently. You must *always* indicate with whom you worked on each problem. You are not to use other sources of potential solutions. This includes, but is not limited to, other texts, the internet, software/programs with “checking”
and computational capabilities (e.g. Maple, Wolfram Alpha, Lurch, etc.), other notes or documents *not* given out by me this semester, other faculty, students, tutors, etc. If you are ever in doubt about what you can and cannot use, ask and ask *before* you use it! Any use of materials outside of those discussed here and *not cleared with me before use* will be considered a violation of the course grading policy and hence the Academic Code of Honesty.