

Advice for students in Math 347

Math 347 emphasizes understanding of fundamental mathematics, clarity of logical thought, and communication of mathematical ideas. Along the way we consider many interesting problems, including “brain teasers” of the sort that make mathematics a lively subject. This course is about understanding and thinking carefully, not about computation or memorizing formulas. Discussion in class may go beyond what appears in the text.

Homework and test questions require clear and complete explanations. In this course, “construct”, “show”, “determine”, “obtain”, etc., are synonyms for “prove”. A complete solution to a problem requires justification, unless it is explicitly stated that no proof is required. Language must be assessed carefully for ambiguity, when communicating mathematics, and word order is important, just as in real life. For example, the statements “Not all cookies are sweet” and “All cookies are not sweet” use the same words, yet have very different meanings.

Many students initially have trouble writing proofs because they have never been required to write English clearly. To improve your writing, think about the homework early, and write a draft solution. READ your draft a day or more later. If it doesn’t read sensibly or doesn’t convince you, then REWRITE it. Try to say what you mean, and mean what you say.

Mean what you say: be intellectually honest. Intellectual dishonesty includes:

- 1) Stating a “reason” without understanding its relevance to the argument.
- 2) Claiming the conclusion when you know you haven’t actually proved it.
- 3) Giving an example and then claiming you have proved the statement for all instances.

Say what you mean: use sentences that accurately convey your ideas. Careless writing and muddled thinking include:

- 1) Providing only a list of formulas, without indicating which formula is derived from what, or how it is derived.
- 2) Omitting words, thereby writing something other than intended.
- 3) Improperly negating statements involving variables (see the “cookies” example above).
- 4) Failing to prove one of the implications of an equivalence.
- 5) Using a theorem in the wrong logical direction. (Knowing “if $x > 0$ then $x^2 > 0$ ” does not permit you to argue “if $x^2 > 0$ then $x > 0$ ”.)

6) Writing gibberish that you wouldn't understand if written by someone else. Respect the English language, and you will gain valuable communication skills.

Communication also involves reading and speaking. The textbook has many interesting examples, comments, and exercises. We can't discuss it all; it is your responsibility to read the relevant parts of the text. Speaking mathematics helps you understand it in different ways; explaining a proof to a friend will tell you whether you understand it, and may help you find a better way to write it. Working on problems together in small groups benefits both the students asking questions and the students answering questions. Nevertheless, solutions to homework problems must be written **individually** by each student. Copying solutions is unacceptable.

This course requires effort. Your instructor will explain ideas and provide feedback to guide your exploration; you are responsible for the rest. We ask you to make a commitment to intellectual honesty and to learning how to express your ideas; seize the opportunity. If you have trouble understanding what is needed to prove a statement, come and discuss what you have been trying; we will try to correct misconceptions and head you in the right direction.

Make a commitment to the course, and you will gain a lot of personal satisfaction.