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# Expectations of Higher Level Math Courses

## Eight Tips to Help You with the Transition

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### 1. Be Prepared to Adapt to New Expectations

Upper level math classes have a different set of expectations than introductory math courses. Consequently, you may have to adapt your work habits and style of studying. Things that worked in earlier math courses, and which helped you learn the material well enough to get the right answers and pass exams, may not be as successful in this course. You may have to work differently, and you may have to aim for a deeper level of understanding. This may be difficult at first, but it must happen sooner or later, and sooner is better. The goal in college is for more than just getting you to reproduce what was told to you in the classroom. The goal is to have you understand the material and be able to apply it in novel ways. Consequently, a cursory understanding of the material is insufficient. You must aim for mastery of the material.

### 2. Expect the Speed of the Class to be Fast

Expect to have material covered at a faster pace than you may have seen in past courses. You may have been one of the top students in your earlier math courses, but keep in mind that the same is true for almost every other student in this course. Instructors usually try to teach to the average students, so you should remember that as you go on in your math courses, the average will get higher and higher. In addition, you should aim for greater command of the material, especially the ability to apply what you have learned to new situations. Remember that this is a mathematics course that is part of the math major. Part of the purpose of this course is to prepare you for future math courses where the standards, and the speed of the course, will be even higher.

### 3. Expect to do a Significant Amount of Learning Outside of Class

Lecture time is at a premium so it must be used efficiently. You cannot be “taught” everything in the classroom. It is your responsibility to learn the material, and most of this learning will take place outside the classroom. You should consistently put in at least three hours outside the classroom for each hour spent in class. Some topics, particularly the more abstract ones, may take even more time and effort for you to understand them and be comfortable using them. You should think of class as a time when we “touch base”, so that you can see additional explanations and examples, as well as have an opportunity to ask questions about anything that is confusing. Class is meant to provide you with the tools you need as you work through the homework on your own.

### 4. Understand the Instructor’s Job

The instructor’s job is primarily to provide a framework to guide you in doing your learning of the concepts and methods that comprise the material of the course. It is not to “program” you with isolated facts and problem types, nor to monitor your progress. That is not to say that you shouldn’t ask your instructor for help. By all means if you have questions or are having trouble with the material, then talk to the instructor. In fact, there are office hours each week for you to do exactly this, and you are strongly encouraged to use these office hours. But remember that you have to put forth at least as much effort as the instructor if you want to learn the material and do well in the course.

It is important for you to remember that the job of the instructor is not to put the material in your brain, or show you how to work problems while you sit there passively absorbing the lecture. To learn the material, you will have to struggle with it on your own while reading the textbook, going through class notes, and working homework problems — in short, you learn by *actually using the material* on your own. This is the same with any new skill, whether it’s learning a new language, learning to swim, or learning to play the trombone — you cannot learn just by watching someone else do it or by listening to someone lecture about it. You have to practice it yourself. The job of the instructor is to give you guidance, answer questions, provide feedback on your performance, and supply you with additional tools and resources that you will need as you study and work on the material on your own.

## 5. Read the Textbook

You are expected to read the textbook for comprehension. It gives the detailed account of the material of the course. It also contains many examples of problems worked out, and these should be used to supplement what you see in the lecture. The textbook is not a novel, so the reading must often be slow and careful. However, there is the clear advantage that you can read it at your own pace. Use pencil and paper to work through the material, and to fill in omitted steps. As for when you engage the textbook:

1. Read, for the first time, the appropriate sections of the book before the material is presented in lecture; that is, come prepared for class. The lecture will then make more sense.
2. In lecture try to absorb the general ideas and/or take notes. Later try to sort out any questions you have while referring to the appropriate parts of the book and your notes. You may also want to re-read the appropriate sections after the lecture, in order to give yourself a second chance at understanding and internalizing the material.

## 6. Talk with the Instructor and Ask Questions

If you are having problems in class or do not understand the material, do not hesitate to talk with the instructor. Do not fall behind. Particularly in mathematics, where new material often builds on previous ideas, getting behind can be devastating. Take advantage of the instructor's office hours. When you are confused talk to the instructor right away. If you wait too long, your difficulties may compound to the point where you will be hopelessly lost. Talk to your instructor early and often to clear up misunderstandings and confusion.

## 7. Write Up Solutions in a Way that Communicates Ideas

It is the student's responsibility to communicate clearly in writing up solutions of the questions and problems in homework, quizzes, and exams. The answer to the question asked will often involve ideas and principles introduced in class, and consequently the solution should be more than just a number or expression — it should be a (sometimes short) argument explaining and justifying how the problem is solved and how the material of the course can be used to arrive at this answer. Remember: the solution is more than just the final answer — it is the process used to arrive at the final answer. This process, and all necessary steps, should be explained so that someone who is familiar with the material could read the solution and understand it. Finally, remember that the rules of language still apply in mathematics, even when symbols are used in formulas and equations.

## 8. Strive for Conceptual Understanding

Finally, and most importantly, you must realize the importance of theory in mathematics. It is not enough to be able to do the problems that are assigned. You must understand the mathematics used to solve these problems. The goal of this class is to make you able to do all problems —not just particular kinds of problems— to which the methods of the course apply. As such, exams will consist largely of fresh problems that fall within the material that is being tested. For that level of command, the student must attain some conceptual understanding and develop judgment. Thus a certain amount of theory is very relevant, indeed essential. Remember that a student who has been trained to do only certain kinds of problems has acquired very limited expertise.