Some advice concerning college level mathematics at Whitman College

Taking a college course is different than taking a high school course. This is a rather obvious statement, but what exactly is different about college courses? The short version for mathematics courses is that the material in a college course is covered at a faster pace, the expectations for understanding ideas and concepts are higher, and the student must do more independent learning outside of the classroom. The following statement is a paraphrased quote from another mathematician that you might find helpful to keep in mind during your first few weeks as a first-year student at Whitman College.

> "You are now in college, not high school. Since you have been accepted to a top tier college/university, it is quite likely that you were taught in high school well below your level of ability. It is important for you to realize this and make the adjustment to college education. You can expect the material to be covered at a faster pace and you will be expected to have a greater command of the material. It is your responsibility to learn the material and much of this learning takes place outside the classroom. The instructor's job is primarily to provide a framework, with some of the particulars, to guide you in 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. You should be wise enough by now to know when you are learning. You should also be learning for its own sake or for some future goal, not because someone is forcing you to study or for the sole reason of getting good grades. In summary, the main difference between high school and college is that you must accept much more of the responsibility for learning."
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> This quote is adapted from Steven Zucker's appendix in *How to Teach Mathematics* (2nd Edition) by Steven G. Krantz, published by the American Mathematical Society.

The following list indicates some specific ways a mathematics course at Whitman College may be different when compared to a high school mathematics course.

1. The pace of the course will be much faster and more material will be covered. You will be expected to learn some of the material on your own outside of class.
2. You will be expected to read the textbook for information, not just to find templates for solving problems. The mathematics department at Whitman College uses open source textbooks when possible. This means that the textbook is available online at no cost. Some students do fine accessing the textbook in this format only. However, other students find it very helpful to print some parts of the textbook so that they can make notes and highlight the material that is most relevant for them. Think carefully about your learning style as you decide how best to work with these types of texts.
3. You need to do the assigned homework even if it is not collected or graded. It is best to do this before the next class period as you often need to know previous material to make sense of new material. Keeping up with the work in this way requires discipline on your part.
4. Studying means more than just doing homework problems. You must look over your notes and the textbook and think carefully about the ideas, concepts, definitions, and theorems.
5. There is an increased emphasis on concepts and these must be understood at a deeper level. Learning mathematics is not the same as performing computations. We pay attention to your use of mathematical notation and expect complete sentences for conclusions to problems, not circled or boxed answers.

6. You will be expected to solve some problems without seeing or reading an example of that type of problem. These non-routine problems often involve the ideas that have been discussed in class or in the textbook but a pattern for the solution may not be available.
7. Much of your learning in this course will take place outside of class as you read the textbook, think about the ideas, and do the homework problems. You should plan on at least two to three hours of studying (preferably with uninterrupted concentration) outside of class for every hour in class.
8. Some questions on exams will focus on concepts and/or making connections between concepts, not simply solving homework problems with different numbers.
9. For many mathematics exams at Whitman College, you will not be allowed to use any electronic devices, that is, calculators will not be allowed during exams. This means that you should not rely too heavily on calculators (especially for simple calculations) when doing the homework problems.
10. Your course grade will be determined primarily by your test scores, with homework perhaps counting for a small part (usually less than 20%) of your overall grade. There are no retakes of exams to improve scores and there are seldom any opportunities for extra credit.

Because of the increased level of difficulty, some students choose to study together and/or work with a tutor. While this is not necessarily a bad idea, it is important to know that struggling with the material is often the best way to truly learn it. If you get too much help, you will not be learning the material at the expected level and your performance on exams will probably suffer. You should keep distractions to a minimum when studying and avoid using the Internet to search for solutions. Mathematics is a difficult subject but the rigorous training in abstract thinking that it provides is useful for many types of jobs.

One of the advantages of a smaller college is that you have more opportunities to meet with your professor and get feedback on your progress. You should take advantage of office hours and pay attention to the comments you receive on your homework, quizzes, and/or exams. Often a ten minute conversation with the professor can point you in the proper direction and save you from a lot of confusion or inefficient effort. Many of you chose to attend Whitman College partly because of the ease of access to your professors so do not shy away from taking advantage of this access.

At the end of each semester, you are asked to evaluate your professors. Here are some questions that could be put on a "student evaluation by instructor" form, using a standard agree/disagree scale.

1. The student made every effort to attend each class and to arrive on time.
2. The student came to class alert and prepared.
3. The student was actively involved in the class.
4. The student showed respect for the instructor and other members of the class.
5. The student brought energy and intellectual curiosity to the classroom.
6. The student finished assignments promptly.
7. The student followed directions and did careful work on each of the assignments.
8. The student made appropriate adjustments in response to feedback from the instructor.
9. The student contacted the instructor when difficulties or confusion arose.
10. The student was willing and able to work independently.
11. The student had a good knowledge of prerequisite material.
12. The student performed at the level of his/her ability.
13. The student had a realistic view of his/her mastery of the material.
14. I would recommend this student to another instructor.

When professors assign grades, they are measuring the performance of the student in the course; this is different than giving an evaluation of the student using statements like those above. Thinking about these items during the semester may help you determine your level of adjustment to college level expectations. This is especially true for those of you who may need a letter of recommendation from a professor for a summer internship or graduate school. More generally, a low score (disagree) on some of these items may help explain why your performance in the class is less than you had hoped or expected.

Speaking of grades, since many students entering Whitman College have primarily received A's in high school, it can be quite a shock to earn a C or D on the first calculus exam. It is often the case that such a grade jump starts a student into better study habits. However, it is possible that even with improved study habits, a student will end up with a C in the course. There are many reasons for getting a lower grade than in high school. These include a lack of prerequisite knowledge, difficulty with the expectation of understanding the material at a deeper level, or not enough hours in the week to do all of the activities of college life. Briefly, you can think of letter grades for mathematics courses in the following way (although such distinctions will vary depending upon the course and/or the professor):

A (excellent) The student knows and understands all concepts well and makes very few computational errors. There are very few, if any, gaps in prerequisite knowledge and the student can write mathematics clearly and correctly. The student can apply techniques and concepts to solve new and unfamiliar problems. The student is encouraged to take more courses in mathematics.

B (good) The student knows and understands most of the concepts well and usually does not make computational errors. There are a few gaps in prerequisite knowledge and the student occasionally has difficulty writing mathematics clearly and correctly. The student has some trouble solving new and unfamiliar problems but can finish the problems once given some direction. The student has sufficient skills to take further classes that have the material in this course as a prerequisite.

C (average) The student knows and understands the majority of the key concepts but has trouble with some of the computations and may be unsure how to start some problems. There are some clear gaps in prerequisite knowledge and the student has difficulty writing mathematics clearly and using correct notation. The student has trouble solving new and unfamiliar problems even with some guidance. The student should seek some advice from someone in the mathematics department before taking additional courses in mathematics that require knowledge of the given course as a prerequisite.

D (poor) The student knows and understands some of the key concepts but struggles with some of the important ideas and has trouble with computations. There are a number of gaps in prerequisite knowledge and the student has difficulty writing mathematics and using correct notation. The student has trouble solving problems, even those similar to examples. Except in the case of extenuating circumstances, the student should probably not take higher level courses in mathematics.

F (fail) The student understands very little of what was covered in class and has trouble with even basic computations. There are large gaps in prerequisite knowledge and general problem solving skills are lacking. More likely than not, the student did not invest much time or energy in the class.

Although time spent on the course typically raises the grade for the course, it is possible for someone to study 15 or more hours a week in a course just to earn a C and for someone else to put in about 3 hours a week and earn an A. This may not seem fair. However, as with many aspects of life, people have different

backgrounds and abilities in various disciplines, academic or otherwise. It is important to remember that hard work always improves your skills. Furthermore, it is important to realize that needing to work hard in a class does not mean that you cannot succeed in the course or that you should not take more courses in that field. Finally, your course grade indicates your performance level in a certain class during a specific period of your life; it does not reflect on your value as a person.

Let me add a few words about partial credit. Students often expect to receive partial credit for solutions that indicate they have some idea of what to do on a particular problem but they are not able to finish the problem or they make some computational errors and end up with the wrong answer. In what other field of endeavor is partial credit given? Does a surgeon receive partial credit for removing two-thirds of an appendix? Do you want to hire a lawyer who only learns some of the facts related to your case? Do you take your car to a mechanic who only does some of the maintenance that your car needs? Do you give a good tip to a wait-staff person who only brings part of your dinner order? The list could go on and on. It is best to learn to do things right the first time; working carefully and accurately is an important skill to acquire. For many problems in mathematics, it is possible to check your answer—not by looking in the back of the book but by, for example, plugging solutions back into an equation to be sure they work—or at least to be certain that your answer is reasonable. You should get into the habit of reflecting on your work and strive for full solutions, not just being on the right track.

Finally, the top ten candidate attributes sought by employers are the following:

1. Problem-Solving & Critical Thinking: Ability to analyze issues, think creatively, and find effective solutions.
2. Communication Skills: Clear verbal articulation, active listening, and concise written expression.
3. Teamwork & Collaboration: Working effectively with others to achieve shared goals.
4. Work Ethic & Initiative: Strong drive, reliability, dedication, and taking proactive steps.
5. Adaptability & Flexibility: Willingness to learn new things and adjust to changing environments or technologies.
6. Technical Skills: Proficiency in relevant job-specific tools, software, and data analysis.
7. Dependability & Accountability: Being responsible, meeting deadlines, and being present/available.
8. Professionalism & Interpersonal Skills: Maturity, respect, empathy, and positive interactions with colleagues.
9. Analytical Skills: Evaluating information objectively, identifying biases, and making logical decisions.
10. Curiosity & Lifelong Learning: A desire to continuously learn and grow, including understanding new trends like AI.

You should consider pondering this list and thinking about which aspects of each of your courses (not just math) and extra-curricular activities help you to acquire these skills.