Written Exam in Mathematics

The mathematics written exam is composed of a common portion taken by all seniors who are majoring in math, econ-math, or math-physics and another portion that is taken only by math majors. The common portion consists of four questions on Math 225 (Calculus III) and four questions on Math 240 (Linear Algebra). Math majors will also be given four questions on Math 260 (Introduction to Higher Mathematics). The exam is typically scheduled for 9:00 am to noon in Olin 201 on the third Saturday after the start of the fall semester. Given the timing of the exam, one of the keys for doing well on the exam is to do much of your preparation over the summer. Waiting until you return to campus in the fall, with all of the usual busy activities at the start of a semester, does not allow you to have sufficient time to prepare for the exam. Our advice for a study schedule is to start at the beginning of the summer and study a little at a time. However, you may do as you think best and/or your summer plans allow.

During the week after the exam, the mathematics and statistics faculty will grade the exams and consider whether each student should receive a grade of "pass with distinction", "pass", or "fail". There are no hard and firm numbers, but in the past we have frequently required a score of 70% and above to pass and a score of 90% and above to obtain distinction. It is important that you do well on the exam the first time. This is necessary in order for graduation with honors to be an option, but it may also provide the faculty with another data point to consider when writing letters of recommendation for employment or graduate school. Should it be necessary, a retake of the written exam will be scheduled on some Saturday in mid-October.

See your adviser or contact the department chair if you have any questions concerning the written exam. On the exam, we are looking for evidence that you have a basic understanding of the key concepts from these courses. It is expected that your understanding of the basic ideas in these courses has deepened as you have advanced in your mathematical education. For example, theorems and abstract ideas should be clearer to you by now. It is up to you to determine what to study and how to manage your timeline for doing so. At this point in your mathematics career you should have learned how to distinguish between ideas that are central and those which are peripheral. As a quick illustration, we do not expect that you have an antiderivative of $\sec^3 x$ memorized or even that you remember the special tricks used to compute it. However, you should certainly know basic integration techniques (such as integration by parts) and various ways to approach finding the value of a double integral.

Brief summaries for each of the three courses covered by the written exam can be found at

`http://people.whitman.edu/~gordon/mathwrittens.html`

by following the clearly marked links. You should read through these very carefully and look up topics that are unclear to you. You should do a number of problems from various sources (your notes and exams from the class, calculus books in Olin 207, online texts, etc.) to prepare for the exam. Links for sample problems in each of the three areas, along with complete solutions for the Math 225 and Math 240 problems, are also located at this site. If you choose to use these resources, be certain that you think about and work on a problem prior to looking at the answer. There are two lessons to be learned here. First of all, starting a problem can be the most difficult part and even a quick glance at the solution can be a powerful hint that is not going to be available on the exam. This can give you a false sense of security. Secondly, checking your answer with the solution, realizing that it is incorrect, and then finding your error means that you would have missed the problem (or at least lost some points) on the exam. You need to learn to work precisely, checking results along the way. For instance, there is no excuse for getting an incorrect cross product of two vectors since it is so easy to verify that your answer is correct. The same can be said for the inverse of a matrix. The bottom line is, whenever there is a way to check your answer, you should do so.

As indicated in the title, this is a written exam in mathematics. Hence, in addition to your ability to solve the problems, your use of notation and writing style will be evaluated. We want to see evidence that you understand the concepts **and** know how to present mathematics. To this end, you should write neat, clear, concise, and accurate solutions to each of the problems, including all relevant steps, using correct notation, giving sufficient details, and concluding each problem with an appropriate complete sentence. No electronic devices are allowed for this exam. All of the problems are of equal value.

On the morning of the exam, each of you will be given some scratch paper (which must be turned in at the end of the exam) and a paper clipped packet containing four pages of questions for Math 225 and four pages of questions for Math 240. Please be certain to write your name on each page containing a problem (since the problems will be distributed for grading), recording a somewhat polished solution to the problem on that page. Unless you are a mathematics major, when you have finished this set of eight questions, you are free to go. For math majors, you will turn in those solutions and receive a second packet containing four questions on Math 260 (Introduction to Higher Mathematics).

Since you have three hours for the exam, it may be likely that you will need to stand up and/or use the restroom. (If you do not do so, at least pause on occasion to take a few deep breaths.) If you do exit the classroom, we ask that you leave your phone on the front desk for the time period in which you are gone. Of course, you could just leave your phone at home for the exam or leave it safely tucked away in your backpack.

By this point in your college career, each of you have now taken quite a few exams in mathematics. However, it may prove helpful to be reminded of the following points.

1. It is a good idea to arrive a few minutes early so that you can have your stuff sorted out and have a minute or two to get comfortable before the exam begins.

2. Please spread out through the classroom so that you are not sitting next to anyone, that is, leave an empty chair between yourself and other students. Make sure that you avoid looking at other people's work; this is not the time to risk a case of academic dishonesty.

3. Remember to think during the exam. This may sound silly, but it means that you should not just blast into the first thought that comes to mind for a problem as there may be a much easier way to approach the problem once you ponder it for an extra few minutes. Check your work as you go to avoid making silly mistakes and wasting time having to do things over again.

4. If you get stuck on a problem, do not panic and go into "my life is ruined because I am stupid and will never graduate with a math degree" thinking pattern. Just do the best you can on the problem and move on to other problems with a positive mindset.

5. Get some decent rest and sleep the night before the exam. At that point in time, there is not much more studying that you can do that will have a positive benefit. You are much better off coming to the exam with a relaxed and rested mind rather than trying to cram in some knowledge in a last minute frantic rush.