

An Introduction to the Written Exam in Mathematics

The written exam in mathematics for mathematics majors covers topics from multi-variable calculus (Math 225), linear algebra (Math 240), and intro to higher math (Math 260). In its most recent form, the exam is divided into three sections with four problems on each of Math 225, Math 240, and Math 260. Combined majors (econ/math and math/physics) are only tested on Math 225 and Math 240. 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 of each of the three courses can be found by following the obvious 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 (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 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.

It is important to realize that this is a written exam in mathematics. We **expect** that you have learned to write mathematics over the past three years. This includes using correct notation and complete sentences. In previous years, the heading for the exam has read as follows:

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.

Mathematics is a very precise language, both in its use of words and symbols. You should carefully consider this fact as you write solutions for the written exam.

We allow students three hours for the exam. This may be a longer period of intense concentration than you are accustomed to so be certain to come to the exam well rested. As you read each problem, take a moment to pause and reflect on what is being asked. Think about the big picture and the key ideas that are involved. Then do some careful scratchwork to sketch out the details. When you feel confident in your solution, write down a neat and polished solution to the problem.