Information on preparation of GRE Advanced Math Exam.

This information sheet is prepared with the help of John Lynch ('10), Alex Walker ('12), Sean Talia ('12) and some of our current graduate students. 6/19/12

A) Things that you should be aware of:

1) The four practice exams offered by ETS are misleadingly easy. The real exam is much more difficult than that. Please be aware.

2) When studying, focus on reviewing the basic theorems, their statements and their applications. The questions usually did not ask for proofs nor require any deep understanding of why the theorems hold.

3) It is a good idea to take the exam twice. There are two different suggestions by our alumni:

   i) You can take the exam in your junior year to get a "feeling" of it, then study more during the summer and take the exam again in the Fall of the senior year. You are allowed to choose the highest score to report to your graduate school.
   
   or
   
   ii) Sign up for both October and November exams during the senior year. Please note that registration for the November GRE closes the night before you take the October GRE. If you wait to register for the November test until after you suspect that you have performed poorly on the October test, you have waited too long.

4) Asian and Eastern European students usually got very high scores > 90%. However, for the American students, a score around 75% is very decent and one can get into many very good graduate schools with that score. This year (2012), Yale accepted a US student with score 78%, because he has a very strong research record. In the old days, Berkeley had the policy of not considering any applicants with GRE score < 85%. This policy had since been changed.
B) How to study for the test?

1) You should start studying at least 6 - 8 weeks before the exam and should do a little bit every day, if possible. There are lots of material covered on the exam and is impossible to cram it all in a week or two.

2) The Princeton Review book is a necessary but not sufficient way to prepare for the test. Make sure that you know the materials mentioned in the review book very well in order to get a decent score. However to get a good score, you have to study more.

3) Here are some additional preparations that you can do after the Princeton Review.
   i) Calculus/Analysis part: You should be very familiar with sequence, series, the behavior of functions on compact or connect sets, uniform convergence etc.. You can practice some of these topics by working on the tricky problems (skip those epsilon-delta ones) in Spivak's Calculus. They have problems such as recognizing the limit of a sum as a Riemann sum or computing limit using Taylor series. Those questions are very helpful and similar to that of the GRE.

   ii) Multivariable Calculus part: Review all the multivariable stuff together with advanced surface integral, Gauss and Stokes' theorems using Lang's "Calculus of Several Variables" and Kranz/Blank "Multivariable Calculus".

   iii) Combinatorial part: Any standard discrete math/ combinatorics book will help you to prepare.

   iv) Probability part: Similar to MT426 but with more emphasizes on finite probability.

   v) Linear Algebra part: There are many linear algebra problems related with matrix in the exam.

   vi) Algebra part: Review the exercises from your algebra class, and also those from Herstein's "Abstract Algebra" and "Topics in Algebra". Students are expected to be
very familiar with examples and basic properties of groups (in particular finite abelian groups), rings and field.

vii) Topology part: Students are expected to understand the basic definitions of the standard terms in point-set topology such as Hausdorff spaces, connected spaces, and compact spaces. There are some nice exercises in the first few chapters of Simmons's "Introduction to Topology and Modern Analysis". Also, many of the questions in topology can be answered by giving thought to some specific examples. "Counter-examples in Topology" was good preparatory material for this reason.

viii) Complex Analysis Part: Review the MT 460 material to prepare for the topics in complex analysis. It is reported that questions about Open mapping theorem, Residue theorem, Laurent series and roots of unity have been surfaced in the previous exams.

ix) Differential Equation: Review MT410 material. Be aware of the cases where the differential equation can have constant solutions or split solutions. Be familiar with the properties and dimensions of solution sets too.

x) Geometry: There will be very few questions that deal with geometry alone. Geometry arises (in 3 dimensions) in the context of multivariable calculus, and plane geometry might show up in 1-3 questions. Nevertheless, a quick refresher on basic geometry (especially analytic geometry) will help you on calculus and a variety of other topics.

C) Exam Strategy:
1) During the exam, manage the time wisely. Some students reported that they did not have the time to finish the test or they had to rush through the last ten questions in a hurry.

ii) Sometimes it is easier to work from the answers. For example, if a question asks you to integrate some expression, differentiating the answers (in order of estimated
correctness) can at times be of use. In any case, one should look at the answers to see if they contain clues to the problem.