

Math 561 — Spring 2006 — Test Guidelines

The test will be 50 minutes hours long, in class on Friday 10 March.

Material: everything covered in class and homework, through Section 2.4a (the CLT for i.i.d. sequences). Only the topics covered in class are examinable; you are not responsible for sections of the text that we didn't cover in class.

Read the advice overleaf in the handout “How to Prosper in Math Graduate School”. Especially notice the part about thoroughly understanding every **homework** problem. And learn the **definitions** and the statements of all major **theorems** and **formulas**. Memorize the main probability densities that we use as examples (Bernoulli, Binomial, Geometric, Poisson, Uniform, Normal, Exponential).

One of the problems on the test might ask you to reproduce a proof. Following are the proofs you should learn. (You are not required to learn the statements of the results, although it is helpful to do so.)

- Theorem 1.4.2 (independent π -systems generate independent σ -algebras). For notational simplicity, just learn the special case $n = 2$.
- Theorem 1.5.2 (L^2 Weak Law of Large Numbers for i.i.d.s), including the proof of Lemma 1.5.3 (Convergence in L^p implies convergence in probability).
- First Borel–Cantelli Lemma 1.6.1.
- Theorem 1.6.5 (L^4 Strong Law of Large Numbers).
- Second Borel–Cantelli Lemma 1.6.6.

And here are a few exercises to try from the textbook: 1.6.14, 2.3.9, 2.3.11.

Of course, there are a lot of smaller topics you should learn and understand as well, so don't ignore a topic just because it is not on this list of proofs. Re-read *all* your lecture notes carefully.

Plan your study schedule today, so that you will have time to learn everything!

How to Prosper in Math Graduate School

In graduate school you are always overworked and overcommitted. This is not going to change, as it is the only way to bring you rapidly up to the level required of professional mathematicians.

The way to succeed is to work consistently and promptly, and on the RIGHT THINGS:

- Go over your lecture notes after every class, trying to understand every detail but also the big picture (“what are we aiming at?”)
- After you get your homework back, rewrite in full every problem on which you made significant errors. Do **not** put this task off until you study for the next test or exam.
- After you get your test back, rewrite in full every problem on which you made significant errors. Do **not** put this task off until you study for the final exam.

Regard your errors as *system* failures, not personal failures. Ask: How could you improve your study *system* to eliminate that kind of error in future?

- At the end of every work day, ask yourself “Did I ask any good questions today?” Just *asking* a question can help you focus your own thoughts.

Here’s the baseline level of competence you should attain before each test or exam:

- Be able to recognize every homework problem, then quickly recall its key points and graphs, and write out the solution. (Some exam problems will be similar to homework, and you are expected to recognize these problems.)
- Be able to write down every proof on the “list” without hesitation. Know where to start and stop, on each proof. When studying, you should write out each proof several times, to get quick at it.

To achieve this level of competence, start studying at least a week before the exam. Follow a detailed daily plan. Plan *exactly* what you will work on each day.