Final Review Guide for Math S305

Summer 2014

The final will be held on Friday, July 18th. You will be given the entire class time to take the test, and more! We will actually start the test right at 8:30 and you will have until the end of class 11:30 to work on it – i.e. a full three hours for the final.

To keep you from feeling as if you need to memorize a lot of formulas or examples (which was not the intention of the class), please feel free to bring in notes to use during the final test. To keep from having to flip through lots of papers, it might be useful to prep for the test by writing down a set of pages of summary notes to use. You can also bring a calculator if you'd like, but you should be able to do the whole test without needing one.

The final will be cumulative, meaning that anything from the summer is fair game for questions (see the list of topics below), including material you might have already seen on the take home midterm. To get ready for the final it would probably be useful to start by creating an overview page in which you outline the highlights of the classes just to refresh your memory of what we covered in each class during the semester – flipping through the Powerpoint slides that are available on the website is probably the easiest way to do this. Next you'll probably want to go through all your homework problems, taking a look at the answer sheets whenever necessary.

Instead of going through the homework problems in sequential order, it might be more useful to approach it in a random way at first, picking questions at random to try to do again (not writing them out again, but just mentally retrying them). The reason for doing it this way is that this better replicates your experience on the final, when questions can come at you from all the different classes we've had this summer, and it's up to you to be able to put them in context, remembering what the key points were to answering them.

Next, you will probably want to go through the Powerpoint slides and your class notes in more detail, making sure that you understand the concepts that were covered in each class.

Finally, you'll want to review all of the homework problems systematically, working through all the ones that might have given you difficultly earlier on in the semester. Knowing how to do all the homework problems well should put you in very good shape for the final – I won't promise that everything on the final will mimic questions you've seen before, but with a little bit of work on your part while you're actually taking the final, you should be able to take it with confidence.

Feel free to get in touch with me at any point before the final to touch base with any questions you might have, or just to make sure you're thinking about something in the right way. The best way to get in touch is by email, but feel free to call me on my home phone (781-676-0676) as well (anytime on Thursday night – thanks!). I check email frequently and you don't have to worry about sending a message late in the evening (or in the middle of the night – although don't expect an immediate reply then!)

In terms of topics for the final, I've gone through all the material that we've covered during the summer and created the following list of key topics. You should expect that there'll be at least one question from each of these five topic areas.

Topics to focus on from this summer's class:

1) Sequences and Series

Definitions (e.g. arithmetic, geometric, and others), closed formulas, recursive formulas

Finding sums of series, both finite and infinite (when they exist)

Recognizing/working with the Harmonic Series

Infinite series representations of Cos(x), Sin(x), and e^x.

2) Polynomials

Determining polynomials that match particular input/output tables
(following both approaches –"building up" and "going down")

The Binomial Theorem and its connection to Pascal's Triangle

Combinatorial polynomials as the arose in the polynomial fitting approaches

3) Generating Functions

Finding generating functions for simple examples (e.g. $1/(1 - a X)$, $1/(1 - X^n)$)

Use generating functions to solve a problem like the "how many ways can you take 8 coins from a pile of pennies, nickels,…" one that you saw in assignment 1, problem 6

4) Classic Formulas

Please review the approach we use to find the Quadratic formula

Be knowledgeable about the first step we took to find Cardano's formula – i.e. the transformation trick that eliminated the X^2 term in the general cubic equation

$$AX^3 + BX^2 + CX + D = 0$$

5) Complex Numbers

Visualization using an Argand diagram (both rectangular and polar (modulus/argument) expressions)

Algebraic and geometric understanding of operations (e.g. addition/multiplication)

6) Trigonometry

Geometric definitions of Sin, Cos, Tan using the unit circle

Basic identities (e.g. $\text{Sin}^2 + \text{Cos}^2 = 1$, Sin(A+B), Cos(A+B)), and their proofs using a variety of approaches

In terms of material you don't need to be concerned about – there will be nothing about *Mathematica* on the final (no deciphering command lines, or having to create them). There will be nothing from the last class (conic sections, hyperbolic trigonometry).

Finally, a last thought on tests - although taking tests is hardly anyone's favorite activity, please remember again that one of the main reasons for having a test at all is to give you an incentive to pull things together before the test – this is the real point of this whole exercise, so be sure to set aside enough time to do this in an unhurried way. This test is not just about facts that can be memorized, but also about concepts and explanations, and remember that these are hard to cram in the night before the test!

Also, take it easy on yourself, everyone's done a fine job keeping up with coming to class and doing the homework, so hopefully it won't be too much of a stretch at this point to get ready for the final. And of course there are no more homework assignments to deal with this week – just getting ready for the final.

See you all on Friday!

Andy