

# Midterm Guide for Advanced Algebra and Trigonometry

## Summer 2014

The midterm will be held in class on Thursday, July 10th. After a presentation on the Montessori method by Alexa at the beginning of class, we'll switch over to the midterm by 9:45 and you can have until the end of class (11:30) to work on it.

For this test you won't be allowed to use any notes. You can bring a calculator with you if you'd like, to check your work, but you should be able to do the whole test without needing one.

Although questions on the midterm could cover material coming from any of the classes we've had together this summer, there are a number of specific items that I can alert you about to make sure that you've reviewed sufficiently for the types of problems you might encounter on the midterm.

For the midterm, please be sure to know, or be able to do, the following:

- How to find the rational polynomial expressions for basic generating functions
  - e.g.  $1/(1-x) = 1 + x + x^2 + x^3 + \dots$
  - be able to find the rational polynomial expression for the Fibonacci generating function.
- How to 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
- Using generating functions to find the values of certain numbers (like what we did for the Fibonacci “sum” .11235…)
- Be able to find a closed formula for certain types of recursive functions
  - following the technique used in problem 1 of assignment 5
- Be able to find sums of arithmetic and geometric series (when the sum exists in any event!)
- Be able to give a concise mathematical definition for when a sequence converges to a limit  $L$ 
  - look at class 4, page 21 (in the class Powerpoint slides).
- Given an input/output table for a polynomial function be able to find a possible formula fitting the given data –
  - using the method of building up the function using differences (our first approach)
    - so know formulas for sums of integers, sums of squares, and sums of cubes
  - using the method of combinatorial polynomials
    - so know the definitions for the combinatorial polynomials – be able to write down examples of such polynomials
- Be prepared to be able to prove basic corollaries of the Long Division Theorem
  - such as the Remainder Theorem, the Factor Theorem, and the Number of Roots Theorem

In terms of tricks or puzzles we've worked through:

- Know the trick for finding a polynomial (with non-negative integer coefficients) given just a couple of evaluation points
- Know basic tricks with Pascal's triangle and how to show them
  - e.g. that the sum of each row is a power of 2 and the alternating sum of each row is 0

Also note that there are certain things that you won't have to deal with on the midterm, for instance you don't need to know:

- Don't need to memorize any history facts (i.e. no names of people or of specific written documents like *Kitāb al-muḥtaṣar fī ḥisāb al-ğabr wa-l-muqābala!*)
- And you don't need to know anything from today's or tomorrow's classes for the midterm

Be sure to review all your homework sets, and the homework solutions that are posted, as I might pull a question off a homework set and put a very similar question on the midterm. Even if you've gotten full credit on a homework question, please do be sure to go through the homework solution notes to see if there are any other aspects of the question that you might have missed.

If you have any questions about the midterm, please feel free to email me or call me at home at 781-676-0676 at any point before the midterm (just please no calls after about 10pm – thanks!)

Good luck in your studying! Please don't panic as you get ready – one of the main reasons for having a test at all is to give a bit of an incentive for you to pull things together before the test – this is the real point of this whole exercise, so just do your best to organize your notes – create an outline of the ideas/problems we've seen and then practice problems by going through your homework again.

See you on Thursday!