

## Outline of topics

### I. Intro to trig functions (\*\*\*)

- radians: know the five standard angles in the first quadrant
- exact values of trig functions at standard angles
- definitions of the six trig functions in terms of sine and cosine
- graphs of sine, cosine, and tangent
- graphing sinusoidal functions

### II. Manipulating expressions and equations involving trig functions (\*)

- inverse trig functions: know how to *use* them (e.g. when to take  $\pi - \theta$  in triangle problems)
- identities: know how to *use* the pythagorean identity, the sum/difference formulas for sine and cosine, and the double-angle formulas for sine and cosine (e.g. for Chebyshev polynomials)

### III. Solving triangles (\*\*\*)

- soh-cah-toa for right triangles
- law of sines for ASA and SSA triangles (SSA is tricky!)
- law of cosines for SAS and SSS triangles

### IV. Complex numbers, the complex plane, factoring polynomials (\*\*)

- standard and polar form of complex numbers
- complex powers and roots
- factoring polynomials over the real and complex numbers

### V. Conic sections (\*)

- parabolas, ellipses: characteristics, equations, graphs

### VI. Systems of linear equations (\*\*)

- terminology: inconsistent, consistent, independent, dependent
- solve 2-var and 3-var systems using *your preferred* method (substitution, elimination, matrices)

### VII. Sequences (\*\*)

- sequences: list form, recursive formula, general formula for  $n^{\text{th}}$  term, summation notation
- arithmetic sequences: initial term and common difference, finite sums
- geometric sequences: initial term and common ratio, finite sums of geometric sequences, infinite geometric series

Topics *not* included on the exam: area of triangles, vectors, hyperbolas

## Hierarchy of knowledge and skills

I. Foundational: *This is material that I expect you to understand thoroughly. You should commit the facts to memory and make sure the skills are automatic. A few problems directly test your understanding of this material, and many other problems depend your mastery of this material.*

1. draw and label the five standard angles in first quadrant and corresponding points on unit circle
2. definitions of trig functions in terms of sine and cosine
3. exact values of trig functions at standard angles
4. graphs of sine, cosine, and tangent
5. statement of soh-cah-toa, law of sines, and law of cosines
6. add, subtract, multiply, divide complex numbers, find modulus
7. solve 2-var system of linear equations
8. recognize arithmetic sequences, find initial term and common difference
9. recognize geometric sequences, find initial term and common ratio

II. Standard: *This is the material that I expect you to understand well and the problems I expect you to execute reliably. You should practice these until they become routine. The majority of the exam consists of these problems.*

1. graphing sinusoidal functions
2. solving right triangles
3. solving SAS, SAA, ASA, SSS triangles
4. list possible rational roots of a polynomial
5. factor polynomials over the real numbers and over the complex numbers
6. conversion between rectangular and polar form of complex numbers
7. compute powers of complex numbers using DeMoivre's Theorem
8. determine characteristics of a conic section from its equation and vice versa
9. graph conic section from its characteristics or its equation
10. solve 3-var consistent system of independent linear equations
11. sequences: back and forth between list form, recursive formula, and general formula for  $n^{\text{th}}$  term
12. summation notation
13. finite sums of arithmetic or geometric sequences
14. infinite geometric series

III. Challenge: *This is material that I consider to be challenging. Solving these problems requires a more sophisticated understanding of the material, either because it requires understanding some subtleties or because it requires thinking at a more abstract level. These types of problems constitute about 20% of the points on the exam. Not all the problems listed below appear on the exam.*

1. prove a (named) trig identity from given trig identities (e.g. double-angle formulas from sum/difference formulas)
2. develop a Chebyshev polynomial from  $\sin n\theta$  or  $\cos n\theta$
3. solve SSA triangle
4. compute roots of complex numbers
5. identify an *inconsistent* system of 3 linear equations or solve a consistent system of 3 *dependent* linear equations

## Resources

In your studying you may want to (a) compile a list of basic facts to commit to memory and (b) practice doing problems. You can find information and practice problems in a number of places including:

1. chapter reviews in the book
2. study guides for midterms
3. evaluative exercises
4. midterm exams
5. finals from previous years

As always feel free to stop by my office hours or shoot me an email with questions. Your TA and PAL facilitator are also available to help you.

Good luck!