

Lecture #0 Course Introduction

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Book: Saff & Snider 4th Ed. (Pretty Good)

Website: <http://www.math.ucla.edu/~lchayes/132.3a.08f/>.

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Course: “Analysis of functions of complex variables”.

Not particularly interesting in its own right.

Becomes interesting when we study analyticity properties: *Starting with the derivative.*

Don't worry, *not* 131.

Course will be rigorous but this mostly fun. Proofs: Like derivations in Physics Classes.

No ϵ and δ . (Practically)

- Lots of applications; but cannot develop more than typical mathematician should anyway know.
- This level (and type) rigor is anyway something that applied math, physics, engineering should anyway know.

Want hard-core analysis: Take 131.

In some sense “new mathematics”. I.e. not the usual real numbers.

Not important.

Fresh perspective on the mathematics that we already know.

E.g. revisit “elementary functions” [sines, cosines, logs exponents]
from new perspective.

More advanced:

Look at power series for $\frac{1}{1-x} = 1 + x + x^2 + \dots + x^k + \dots$

Clear: Won't converge past $x = 1$; **function itself blows up.**

But what about power series for $\frac{1}{1+x^2} = 1 - x^2 + x^4 - x^6 + \dots$

— Also doesn't converge (or in any way make sense) past $x = 1$.

Why?

Here we will find some answers.

- Techniques to handle problems that were previously insurmountable.

Most people can do $\int_0^{\infty} \frac{dx}{1+x^2} = \frac{\pi}{2}$.

But, can you do: $\int_0^{\infty} \frac{x^{a-1} dx}{1+x^b}$?

Ans: $\frac{\pi}{b} \sin \frac{a\pi}{b}$.

By the end of this course, matter of minutes.

Further examples from math, physics other sciences.

- Harmonic analysis.
- Solutions of “all problems” in 2D electrostatics, (& fluids).
- Differential equations.
- Mechanical oscillations.
- Summation of series.

Etc. etc.

Will not actually get to do much of these in the course but topics (many of which are in the book) will be readily accessible.

Grading Scheme

I Homework

Counts 10%

- (i) Get right answer *any way you can*.
- (ii) Understand your own answer.

II First Midterm

Counts 15%

Date: Check Website.

Will not be so hard.
Won't count too much.

III Second Midterm

Counts 25%

Date: Check Website.

More substantial.

IV Final

Counts 50%

Date: Check Website.

Comprehensive (but more emphasis on later material).