

Math 4200
Mon 10/3

①

exam Wed 9.1-2.3

begin @ 11:45 (5 minutes before class)
end @ 12:45 (" " after ")

closed book & closed notes.

Topics

Complex differentiability ("analytic")

vs. real diff'ability i.e. $f: \mathbb{C} \rightarrow \mathbb{C}$ vs. $F: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ how do these relate?

- CR equations
- consequences of def. of deriv & equivalent approximation formulation
 - sum, prod, quot rules
 - chain rule
 - chain rule for curves
 - differential map df_z
 - CR is different coord systems. via chain rule for curves
- inverse fun thm
- harmonic functions & harmonic conjugates

Complex transformations

- $e^z, z^n, \log z, z^x, \cos z, \sin z$, compositions & inverses
- branch pts, branch cuts, branch domains

Contour integrals

- computation def'n
 - relation to (real) line integrals
 - Green's thm for contour integrals around domains
contour replacement for analytic integrands, via Green & CR
 - estimates
 - FTC
- Cauchy's Thm I

Homotopy-related ideas

- homotopies
 - fixed endpoint
of closed paths
- simply connected domains

Antiderivatives of analytic fns

- equivalence to path independence
- local antideriv thm, using rectangle lemma
- global antiderivatives in open simply connected domains, using homotopy lemma.

Deformation Thms

- for curves with fixed endpoints
 - for closed curves (Cauchy's Thm II)
- } via homotopy lemma.

Computation of contour integrals when the integrand is analytic,
using FTC and/or contour replacement