

The exam has had an extremely similar format the previous years.

QUESTION 1

Essentially all review from first and second years about basic manipulations of complex numbers and about line integrals. Main questions:

- (1) Write a given complex number in form $x + iy$ or $re^{i\theta}$
- (2) State and use the triangle inequalities
- (3) Find solution(s) to an equation of complex numbers involving polynomials, log, exp, and trig functions
- (4) Compute a line integral

Some line integrals will be zero just by citing Cauchy's theorem, but there will almost always be one where this doesn't apply and you need to do it "by hand".

QUESTION 2

A little bit of a grab-bag. Mostly focused on what it means for a function to be differentiable at a point / analytic and applications of the Cauchy-Riemann equations, but a little bit more about line integrals sometimes appears.

- (1) Defining a region, what it means for a function of a complex variable to be differentiable / analytic, finding where it is differentiable / analytic
- (2) Stating Cauchy-Riemann equations and basic applications, e.g., finding all analytic functions with a given real/imaginary part
- (3) Line integrals: Using "ML bounds" and theorems about antiderivatives

QUESTION 3

Very tight focus on this question – Cauchy's theorems and applications

- (1) State Cauchy's Theorem and Cauchy's integral formula(s)
- (2) Use Cauchy's theorem to calculate contour integrals

Usually will be some contour integrals where Cauchy's formula doesn't apply, just to make sure you understand the conditions required.

QUESTION 4