What to expect on the final exam

November 9, 2022

Exam contains 8 problems and lasts 2 hours. Some problems consist of several parts. Each of the 8 problems gives the same number of points.

No books, notes or calculators, all telephones must be switched off and stored.

1. Integrals

$$\int_\gamma f(z)dz.$$

Path independence, existence of primitives, evaluation: by definition, or using residues, or Cauchy formula. (Chap. 4)

2. Evaluation using residues of integrals on the real line of three types considered in sections 6.2-6.6:

$$\int_0^{2\pi} R(\cos t, \sin t)dt,$$

$$\int_{-\infty}^{\infty} e^{iat} R(t)dt,$$

$$\int_0^{\infty} t^\alpha R(t)dt.$$

3. Find the radius of convergence of a series. (5.2, 5.3)

4. Expand a given function into Laurent series in a given ring, or in Taylor series at a given point. (5.2, 5.5)

5. Find and classify isolated singularities of a given function. (5.6, 5.7)

6. Compute the residue of a given function at a given singularity. (6.1)

7. Find the number of solutions of an equation of the form $f(z) = a$ in a given region, using the argument principle or Rouche's theorem. (6.7)

8. Find images of various sets (curves, regions) under a given analytic function. Find a conformal map between two given regions. (7.1-7.4).