Analysis Qualifying Exam Syllabus
UW Pure Math

October 31, 2025

Below are the calendar descriptions for the courses the analysis/topology qualifying exam is based on. They are not absolutely comprehensive, but give the high level topics that will be covered in the qualifying exam.

Real Analysis (PMATH 351)

Cardinality, countable and uncountable sets, normed spaces and metric spaces, open sets, continuous mappings, finite-dimensional normed spaces, sequence and function spaces, completeness, contraction mappings and the Banach fixed-point theorem, the Baire category theorem, compactness of metric spaces, the Arzela-Ascoli theorem, and the Stone-Weierstrass theorem.

Complex Analysis (PMATH 352)

Analytic functions, Cauchy-Riemann equations, Goursat's theorem, Cauchy's theorems, Morera's theorem, Liouville's theorem, maximum modulus principle, harmonic functions, Schwarz's lemma, isolated singularities, Laurent series, residue theorem.

Measure Theory (PMATH 450)

Review of Riemann integration. Measure spaces: sigma-algebras, Borel sets, outer measure, Caratheodory condition, Lebesgue-Steiltjes measures, translation invariance and regularity of Lebesgue measure. Measurable functions: simple approximation, Egorov's and Lusin's theorems. Integration: monotone convergence theorem, Fatou's lemma, Lebesgue dominated convergence theorem. Signed measures: Hahn and Jordan decompositions, absolute continuity of measures, Radon-Nikodym theorem. L^p spaces: completeness, separability, Riesz representation theorem.

References

[1] L. V. Ahlfors, *Complex analysis—an introduction to the theory of analytic functions of one complex variable*, third edition Reprint of the 1978 original, AMS Chelsea Publ., Providence, RI, 2021; MR4506522

[2] J. E. Marsden, *Elementary classical analysis*, Freeman, San Francisco, CA, 1974; MR0357693

[3] H. L. Royden, *Real analysis*, third edition, Macmillan, New York, 1988; MR1013117

[4] W. Rudin, *Principles of mathematical analysis*, third edition, International Series in Pure and Applied Mathematics, McGraw-Hill, New York-Auckland-Düsseldorf, 1976; MR0385023