Combinatorics and graph theory 2, 2023
Topics for the exam

1. Perfect graphs, interval graphs, other examples. Weak and strong perfect graph theorems (without proofs)

2. Partially ordered sets, Dilworth theorem, dual Dilworth theorem

3. Planar graphs, equivalence of drawings on the plane and the sphere, Euler's formula, number of edges of planar graphs

4. Five color theorem, Four color theorem, Kuratowski, Fáry-Wagner (last three without proof)

5. Geometric and abstract duality, properties, Whitney's theorems (without proof)

6. List coloring number, relationship to the chromatic number, list coloring numbers of planar graphs, Thomassen and Voigt

7. Ramsey theorem for graphs, upper bound for $R(k, l)$ (Erdős–Szekeres), lower bound of Erdős, probabilistic method, Schur, Van der Waerden

8. Turán theorem, relationship of $\mathrm{ex}(n, H)$ and $\chi(H)$ (Erdős–Stone–Simonovits, without proof) maximum number of edges of C_4–free graphs, Erdős–Kővári–Sós–Turán theorem (proof only for $K_{2,2}$)

9. Hypergraphs, Erdős–Ko–Rado theorem, Fisher inequality, Ray-Chaudhuri–Wilson theorem (without proof)

10. Sperner theorem, LYM inequality, dual hypergraph, De Bruijn–Erdős theorem

11. Generator functions, Fibonacci numbers, homogeneous linear recursions, general solution