Combinatorics and graph theory II. 2022 fall, exam topics

We have proved the framed theorems.

1. Perfect graphs, line graphs, examples for perfect graphs: $\boxed{\text{interval graphs}}$, $\boxed{\text{bipartite graphs}}$, $\boxed{\text{weak perfect graph theorem}}$, strong perfect graph theorem.
2. Partial ordering, poset, chain, antichain, $\boxed{\text{Mirsky's theorem}}$, Dilworth's theorem, comparability graph, $\boxed{\text{connection to perfect graphs}}$, $\boxed{\text{proof of Dilworth's thm by the weak perfect graph theorem}}$
3. Plane graphs, planar graphs, $\boxed{\text{Euler's formula}}$, $\boxed{\text{upper bounds on the edge number of planar graphs}}$, Kuratowski's theorem, $\boxed{\text{proof of the easy direction of Kuratowsi's theorem}}$
4. Topological dual, the properties of the dual and $\boxed{\text{the connections between G and G*}}$, algebric dual, weakly isomorphic graphs, Whitney's theorems (I, $\boxed{\text{II}}$ and III).
5. List coloring, list chromatic number, $\boxed{\text{the connection between } \chi(G) \text{ and } ch(G)}$, $\boxed{\text{the connection between } ch(G) \text{ and } \Delta(G)}$, Galvin's theorem, List coloring conjecture, $\boxed{\text{Thomassens's theorem}}$
6. Ramsey numbers, $\boxed{R(3,3) = 6}$, $\boxed{\text{Ramsey theorem and its proof by Erdős and Szekeres}}$, $\boxed{\text{upper bound on } R(k,k)}$, probabilisctic method, $\boxed{\text{lower bound on } R(k,k)}$,
7. $R(c_1, c_2, \dots c_t)$, upper bounds on $R(c_1, c_2, \dots c_t)$, $R_k(c_1, c_2, \dots c_t)$, $\boxed{\text{Schur's theorem}}$, Van der Waerden's theorem, Szemerédi's theorem, $\boxed{\text{Erdős-Szekeres theorem (the happy ending problem)}}$,
8. k-partite graphs, complete k-partite graphs, $ex(n,H)$, $Ex(n,H)$, $\boxed{\text{Turán's theorem}}$, Erdős-Stone theorem, $\boxed{\text{Erdős-Simonovits theorem}}$, $ex(n,H)$ when H is bipartite, Erdős-Kővári-Sós-Turán theorem, $\boxed{\text{proof of the upper bound of Erdős-Kővári-Sós-Turán}}$
9. Set families, hypergraphs, $\boxed{\text{Erdős-Ko-Rado theorem}}$, $\boxed{\text{Fischer's inequality}}$, Ray-Chaudhuri-Wilson theorem,
10. Dual hypergaph, $\boxed{\text{De Bruijn-Erdős theorem}}$, "near pencil" example, Sperner system, $\boxed{\text{Sperner's theorem}}$, $\boxed{\text{LYM inequality}}$
11. Linear recurrence with constant coefficients, Fibonacci numbers, Generating functions, Generating function method, characteristic equation method, $\boxed{\text{Closed-form expression of } F_n}$, determination of F_n by the generating function, determination of F_n by the characteristic equation
12. Catalan numbers, several definitions, $\boxed{\text{recurrence for } C_n}$, $\boxed{\text{closed-form expression of } C_n}$, determination of C_n by the generating function, determination of C_n by the mirroring technique