

MATH 1050 (Combinatorics)

Midterm Information Sheet

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- The midterm is 50 minutes long.
- There will be 5 questions (each possibly broken into few parts).
- The questions are similar to the homework problems. Please make sure you can do all the homework problems.
- One question asks to state some definitions and state a theorem (discussed in class) without proof. Examples are: Euler's theorem on Eulerian trails in a graph, Ramsey theorem, Four color theorem, Cayley's theorem on number of labeled trees. Examples of definitions: degree of a vertex in a graph, a planar graph, (vertex) coloring of a graph, chromatic number of a graph.
- There will be one question related to binomial numbers and binomial theorem (Section 3.4 and Section 8.3). You need to know the formula for the number of integer solutions of $n = x_1 + \cdots + x_k$ when $x_i > 0$, i.e. $\binom{n-1}{k-1}$, as well as the same problem but $x_i \geq 0$, i.e. $\binom{n+k-1}{k-1}$. You also need to know the generating functions of these, i.e. $F(x) = x^k/(1-x)^k$ and $F(x) = 1/(1-x)^k$ (all explained in class, see Section 8.2 in Keller-Trotter).
- There will be a problem related to generating functions and recurrence relations (Sections 8.1-8.4 and Example 9.22 in Section 9.6).
- There will be a problem related to graph algorithms, more precisely you will be given a (small) graph and would be asked to apply Kruskal's or Dijkstra's algorithms on it (Section 12.2.1 and 12.4).
- There will be another problem about graph theory, e.g. Prüfer code of a tree (Sections 5.1-5.6).