MATEMATISKA INSTITUTIONEN
STOCKHOLMS UNIVERSITET
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MM5023 HT21

List of basic theorems and concepts

This list is neither to be taken too lightly, nor too seriously. The latter since around each theorem and concept there are a lot of other important concepts and results and techniques that should not be ignored. And the former, since given an intelligent understanding of these theorems on this list and their surrounding satellites, you should not have any trouble passing the exam and have understood the essentials of the course.

- Principle of exclusion and inclusion (Theorem 8.1)(Example 8.8 on the ϕ-function)
- Rook polynomials(section 8.3, in particular use of recurrence relation (1) to calculate them by removing one square at a time)
- Generating functions, and how to calculate with them is one of the most fascinating conceps in the course (9.1-3)
- example of genretaing functions 1:Partitions (example 9.22-24)
- example of genretaing functions 2: How to express the summation operator(9.5).
- example of genretaing functions 2: How to solve recurrence relations with generating functions—see section 10.4(this also includes the recurrence relations of order 1 and 2, in earlier sections)
- graphs, directed, complete, regular, bipartite...and so on...degree
- graphs: Theorem 11.2
- Euler trails: Theorem 11.3
- Planar graphs: Theorem 11.6
- Hamilton paths
- Chromatic polynomial, and how to compute it (Theorem 11.10)

- Trees(Theorem 12.1,3,5), Spanning trees (Theorem 12.2)
- Understanding spanning trees and depth-first and breadth-first search algorithms 12.1-12.2
- Dijkstras shortest path algorithm, 13.1
- Minimal spanning tree algorithms 13,2(Theorem 13.1)
- Max Flow minimal Cut theorem 13.6
- Affine plane (definition 17.12 and theorem 17.12, which gives the construction of affine planes over finite fields.)

Possibly, it would have been as useful to have written all theorems and definitions....but hopefully this is a useful checklist.