

Spiseseddel 4

Algebra 1, EVU 2011-Aalborg Universitet

Welcome to the second part of Algebra 1.

We will continue using the book: [KN] W. Keith Nicholson. Introduction to Abstract Algebra. Third Edition. Wiley 2007.

7th lecture: Thursday 7th April, 9:00-12:00 at room G5-110.

- Factor groups (section 2.9 in [KN]). We will be using the concept of normal subgroup, homomorphisms and several concepts that you have studied before. It is a good opportunity to stop and review them if you feel insecure.
- Exercises:
 - Ex. A: Let H be a subgroup of G . Prove that if H has index 2 in G , then H is normal. Hint: consider the map $\Phi : G/H \rightarrow H \backslash G$ given by $\Phi(gH) = Hg^{-1}$, prove that it is well defined and it is bijective.
 - Exercises 2.9.2, 2.9.3, 2.9.4 (page 132 in [KN]).
 - Ex. B: We know that every subgroup of an abelian group is normal (Theorem 2, section 2.8). What about the converse? If every subgroup of a group G is normal in G , is G an abelian group?. The answer is negative. Prove that the quaternions Q (see page 123 in [KN]) are a nonabelian group and that every subgroup of Q is normal.

8th lecture: Friday 8th April, 18:00-21:00 at room G5-110.

- *Isomorphism theorem* (section 2.10 in [KN])
- Exercises:
 - Ex. C: Let $G = S_3$ and $H = \{e, (1\ 2\ 3), (1\ 3\ 2)\}$.
 1. Prove that H is a subgroup in G
 2. What is the index of H ?
 3. Compute G/H and $G \backslash H$. Is H normal?
 4. Compute the Cayley table for G/H
 5. Prove that G/H is isomorphic to \mathbb{Z}_2
 - Exercises 2.10.1, 2.10.3, 2.10.22, 2.10.31 (page 137 in [KN]).
 - Ex. D: Prove (with detail) Theorem 5 from section 2.10.

I will post during the weekend in the web page the exercises that you can hand in.

Med venlig hilsen,

Diego