Algebra 1 (2012)-Aalborg University Lecture 22, November 20th

22nd Lecture: Tuesday November 20th, 8:15-12:00 at room G5-112.

- 8:15-8:45 Repetition. Simple transpositions. The alternating group (pages 83–86) + hints of exercises from previous lectures.
- 8:45-10:45 Work in groups. Exercises from [Lau], 2.11 (page 104): A, 39 (hint: use exercise 15(iii)), 43, B, 40 (hint: use $\tau = (1 \ 2)$ and lemma 2.9.8 for (ii)), 49 (i)(ii)(iii), C, 41, D.

Exercise A (exam last year): Compute the order of the permutation $\sigma = (1\ 2\ 3)(3\ 4\ 5)(5\ 6\ 1)$ (hint: the cycles are not disjoint). Compute the sign of the previous permutation σ .

Exercise B (exam last year):

1. Let $\sigma \in S_{13}$,

Compute the order and the sign of σ .

- 2. Let $\sigma_1 = (1 \ 4 \ 2 \ 5 \ 3), \ \sigma_2 = (1 \ 3)(4 \ 5) \in S_5$. Find $\tau \in S_5$ such that $\tau \sigma_1 = \sigma_2$.
- 3. Let $\sigma' = (1 \ 5)(2 \ 4) \in S_5$. Compute the number of inversions of σ' and write σ' as a product of the minimal number of simple transpositions.

Exercise C: Write all the elements of S_4 , each factored into disjoint cycles. Compute A_4 .

Exercise D: Let $H = \{e, (1\ 2)(3\ 4), (1\ 3)(2\ 4), (1\ 4)(2\ 3)\}$. Show that H is a normal subgroup of A_4 . Compute A_4/H and write down the composition table of A_4/H .

• 10:45-12:00 Lecture: Simple groups. Actions of groups (pages 86–88 and as much as we can from 92–100).

Best regards,

Diego