

**Homework number 4 to SF2736, fall 2013.**

Please, deliver this homework at latest on Monday, December 9.

The homework must be delivered individually, and, in general, just hand written notes are accepted. You are free to discuss the problems below with your classmates, but you are not allowed to copy the solution of another student.

1. (0.1p) Find the order of the product  $\varphi \circ \psi$  of the permutations  $\varphi = (1\ 3\ 2\ 7)(4\ 5\ 6)$  and  $\psi = (1\ 2\ 5)(3\ 6)$ .
2. (0.1) Let  $\varphi$  denote the permutation

$$\varphi = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 2 & 5 & 6 & 3 & 7 & 4 & 1 \end{pmatrix}$$

of the set of elements in the set  $\{1, 2, \dots, 7\}$ . Show that there is no permutation  $\psi$  such that  $\psi\varphi\psi = \varphi^2$ .

3. (0.2p) Find the number of permutations of order 4 in the group  $\mathcal{S}_8$ . (Some combinatorics is needed.)
4. (0.2p) Show that the group  $G = (\mathbb{Z}_{23} \setminus \{0\}, \cdot)$  is cyclic by finding a generator of  $G$ .
5. (0.2p) Let  $\mathcal{S}_{10}$  denote the group of all permutations of the set of elements  $\{1, 2, \dots, 10\}$ . Find an Abelian subgroup of size 24 to  $\mathcal{S}_{10}$
6. (0.2p) Find a non-Abelian group of size 48 such that the order of its elements are either 1, 2, 3 or 6.