October 15, 2018 Lecturer Dmitri Zaitsev

Course 1213 - Introduction to group theory 2018

S h e e t 5

Due: at the end of the tutorial

Exercise 1

Write the permutation as product of disjoint cycles and determine its sign:

(i) $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 2 & 1 \end{pmatrix}$;

(ii) $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 3 & 5 & 1 & 6 & 2 & 7 & 4 \end{pmatrix}$;

(iii) $(12)(2345)(34567)$ (product of overlapping cycles).

Exercise 2

Find all cyclic subgroups in the alternating group A_4.

Exercise 3

Is there any non-cyclic subgroup $H \subset G$ with $H \neq G$, where:

(i) $G = S_3$;

(ii) $G = A_3$;

(iii) $G = S_4$;

(iv) $G = A_4$.