Problem Set 3 - Cosets, Normal Subgroups, the Symmetric Group

Problem 1 Write the following product as a product of disjoint cycles

a) (1 2 3 4)(2 3 4 5)(2 4 3)(1 2)(1 4)

b) (1 2)(1 3)(1 4)(1 5)

c) (1 2)(1 3)(1 2)

d) (1 2)(1 2 3)(1 2)

e) (1 2)(1 2 3 4)(1 2)

Problem 2 What are the powers of (1 2 3 4 5 6)?

Problem 3 Find the order of

a) (1 2)(3 4)(5 6)

b) (1 2)(3 4 5 6)

c) (1 2)(3 4 5)

Problem 3 Let $G = S_3$. Let $H = \{(), (1\ 2)\}$.

a) Show that $H < G$.

b) What groups are conjugate to H in G?

c) What are the cosets of H in G?

d) Is $H \lhd G$?

Problem 4 a) What do the conjugacy classes of elements in S_5 look like?

b) How many conjugacy classes are there in S_5?

c) How many elements are in each conjugacy class in S_5?