Keywords, statements, definitions

Let p be a prime.

1. Proof of the final statement of Sylow's theorem: If G is a finite group. Let $Q \leq G$ be a p-group. Then Q is contained in a Sylow p-subgroup of G.

2. The center of a finite p-group is nontrivial.

3. Let P be a finite p-group of order p^a. Assume $0 \leq b \leq a$. Then P has a (normal) subgroup of order p^b.

4. Corollary of the second statement: Every group of order p^2 is Abelian. There are two nonisomorphic: C_{p^2} and $C_p \times C_p$.

5.

   Definition 0.1. *Frobenius groups: Transitive permutation group G on a finite set X. The intersection of the stabilizer of any 2 different elements of X is $\{1\}$. The stabilizer of any element is nontrivial.*

   We will prove at the end of the semester that

   $$K = \{1\} \cup \{\text{fixed point free elements}\}$$

   is a normal subgroup of G.

6.

   Definition 0.2. *$G \leq S_n$ is called a k-transitive permutation group if for every $1 \leq a_1 < a_2 < \ldots < a_k$ and every k different elements of $\{1, \ldots, n\}$ there is an element $g \in G$ such that $a_i^g = b_i$*