1. Prove that any cyclic group of order $p^n$, where $p$ is prime, is indecomposable into a direct product.

2. Let $N$ be a normal subgroup of a group $G$. Prove that $G/N$ is abelian iff $N$ contains the derived subgroup $G'$.

3. Let $H$ be a subgroup of a group $G$. Prove that if the product of any two left cosets of $H$ is a left coset of $H$ then $H$ is a normal subgroup.

4. Prove that every group of order 4 is abelian.

5. Prove that, for any group $G$, the set $\text{Inn}(G)$ of all inner automorphisms of $G$ is a normal subgroup of the group $\text{Aut}(G)$ of all automorphisms of $G$.

6. Prove that $S_n/A_n \simeq \mathbb{Z}_2$. 