1. Read Sections 3.1 and 3.5 as an introduction to symmetric groups. We will prove much more about them later. Determine $\text{Aut}(S_3)$.

2. Let $G = (\mathbb{Q}, +)$ and let $K = \mathbb{Z}$ be the subgroup of integers. Show that $G/K$ is isomorphic to the group of complex numbers of the form $e^{2\pi i \theta}$, $\theta \in \mathbb{Q}$, under multiplication.

3. Steinberger, p. 80, #12–13 (These are really the same problem as your proof should not depend on the size of $G$.)


5. Let $G$ be a group and $S$ any subset of $G$. Prove that $C_G(S) = \{ g \in G \mid gs = sg \text{ for all } s \in S \}$ is a subgroup of $G$. Prove that $Z(G) = C_G(G)$ is abelian and is a normal subgroup of $G$. (In the book this latter is done with a rather high powered trick. You should give a simple direct proof.)