Name:

Problem 1 (3 points). Let G be a group and N be a subgroup of G. When does the set of cosets G/N have a natural group structure?

Problem 2 (4 points). Show that $\mathbb{Z} \times \mathbb{Z}/\langle(1,1)\rangle \cong \mathbb{Z}$.

Problem 3 (3 points). True or false: any two elements in the same conjugacy class have the same order.

Problem 4 (Bonus). Find all the group homomorphisms $S_n \longrightarrow \mathbb{Z}_3$.