

## HOMEWORK 8

1. What is the dihedral group of smallest order that contains a subgroups isomorphic to  $\mathbb{Z}_{12}$  and a subgroup isomorphic to  $\mathbb{Z}_{20}$ . Not need to prove anything, just be sure to explain your reasoning,
2. Let  $|G| = 8$ . Show that  $G$  must have an element of order 2.
3. Let  $G = \{(1), (12)(34), (1234)(56), (13)(24), (1432)(56), (56)(13), (14)(23), (24)(56)\}$ . Find the stabilizer of 3 and the orbit of 3.
4. Is  $\mathbb{Z}_3 \oplus \mathbb{Z}_9$  isomorphic to  $\mathbb{Z}_{27}$ ?
5. Show that  $G \oplus H$  is abelian if and only if  $G$  and  $H$  are abelian.
6. Suppose that  $G_1 \cong G_2$  and  $H_1 \cong H_2$ . Prove that  $G_1 \oplus H_1 \cong G_2 \oplus H_2$ .