

## Topics for the First Midterm Exam

- Definitions and basic properties of groups.
- Subgroups.
- Dihedral groups  $D_n$ .
- Cyclic groups and subgroups.
- Permutation groups, including the symmetric groups  $S_n$ , the alternating groups  $A_n$ , and cycle notation.
- The center of a group  $G$  or subgroup  $H$ ,  $Z(G)$  or  $Z(H)$ .
- The centralizer of an element  $h$  or a subgroup  $H$ ,  $C_G(h)$  or  $C_G(H)$ .
- Normal subgroups, the normalizer of a subgroup  $H$ ,  $N_G(H)$ .
- Cosets and quotient groups.
- Lagrange's Theorem (and its corollaries).
- The product  $HK$  of two subgroups.
- Group homomorphisms and isomorphisms, including the kernel and image of a homomorphism.
- The First Isomorphism Theorem.