1 For each group G and subgroup $H \leq G$ below, list all left cosets of H in G *and* list all right cosets of H in G. You do not need to show every detail of your work.

(a) $G = D_4,\ H = \langle r^2 \rangle$

(b) $G = D_4,\ H = \langle sr^2 \rangle$

(c) $G = Q_8,\ H = \langle -1 \rangle$

(d) $G = Q_8,\ H = \langle j \rangle$

2 Let G be a group, and suppose $H \leq G$ is a subgroup of index 2. Prove that $aH = Ha$ for every $a \in G$.

3 Prove that if $N \trianglelefteq G$ and H is any subgroup of G, then $N \cap H \trianglelefteq H$.