

3. TRUE or FALSE. (If true, PROVE it. If false, give a COUNTER EXAMPLE.)
If every proper subgroup H of a group G is abelian, then G is abelian.

False The group S_3 has 6 elements and is not abelian.
Lagrange's Theorem tells us that the ^{proper} subgroups of S_3 have order 1, 2, 3; hence Lagrange's Theorem also tells us that these subgroups are cyclic; hence abelian.

4. TRUE or FALSE. (If true, PROVE it. If false, give a COUNTER EXAMPLE.)
If H is the set of odd permutations in S_5 , then H is a group.

False (12) is an odd permutation in S_5
but $(12)(12)$ is not an odd permutation.
So H is not closed. It is not a group.