

## H/wk 6, Hint for Problem 2.54

(i) Prove that if  $g, f \in \cap_{i \in I} x_i S_i$  then

$$g^{-1}f \in \cap_{i \in I} S_i$$

(ii) Use induction on the number of distinct subgroups among  $S_1, \dots, S_n$  (note that this is not the same thing as induction on  $n$ ).

In the inductive step you will need to argue that if  $S \in \{S_1, \dots, S_n\}$  has infinite index and  $G = \cup_{i=1}^n x_i S_i$  then  $S$  is contained in the union of finitely many cosets of the subgroups from  $\{S_1, \dots, S_n\} - \{S\}$ .