fourth isomorphism theorem

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Theorem 1 (The Fourth Isomorphism Theorem) *Let G be a group and $N \trianglelefteq G$. There is a bijection between $G(N)$, the set of subgroups of G containing N, and the set of subgroups of G/N defined by $A \to A/N$. Moreover, for any two subgroups A, B in $G(N)$, we have*

1. *$A \leq B$ if and only if $A/N \leq B/N$,*

2. *$A \leq B$ implies $|B : A| = |B/N : A/N|$,*

3. *$\langle A, B \rangle / N = \langle A/N, B/N \rangle$,*

4. *$(A \cap B)/N = (A/N) \cap (B/N)$, and*

5. *$A \trianglelefteq G$ if and only if $(A/N) \trianglelefteq (G/N)$.*