Some Results on Non-commuting Graph Related to a Finite Group

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Let G be a finite group. We define the non-commuting graph $\nabla(G)$ as follows: the vertex set is $G \setminus Z(G)$, and two vertices x, y are joined by an edge (and we write $x \sim y$) if $[x, y] \neq 1$, where $[x, y] = x^{-1}y^{-1}xy$ is the commutator of x and y. We will investigate some properties of this graph. In addition, we will verify the following conjecture for many groups.

Conjecture. *If G and H are finite groups such that $\nabla(G) \cong \nabla(H)$, then $|G| = |H|$.*

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