On finite capable groups

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A group H is said to be capable, if there exists another group G, such that $\frac{G}{Z(G)} \cong H$, where $Z(G)$ denotes the center of G. Define:

$$\begin{aligned}
H_1 =&\langle x, y, z \mid x^9 = y^3 = 1, z^3 = x^3, yx = x^4y, zx = xyz, zy = yz\rangle,\\
H_2 =&\langle x, y, z \mid x^{p^2} = y^p = z^p = 1, yx = x^{p+1}y, zx = x^{p+1}yz, zy = x^p yz\rangle, \quad p > 3,\\
H_3 =&\langle x, y, z \mid x^9 = y^3 = 1, z^3 = x^{-3}, yx = x^4y, zx = xyz, zy = yz\rangle,\\
H_4 =&\langle x, y, z \mid x^{p^2} = y^p = z^p = 1, yx = x^{p+1}y, zx = x^{dp+1}yz, zy = x^{dp}yz\rangle, \quad p > 3,
\end{aligned}$$

where $d \not\equiv 0, 1 \pmod{p}$. The aim of this paper is to prove all groups H_i, $1 \le i \le 4$, are not capable.

References

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