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Posner´s Second Theorem and an Annihilator Condition with Generalized Derivations

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Abstract: Let R be a prime ring of characteristic different from 2, with extended centroid C, U its two-sided Utumi quotient ring, $\delta \neq 0$ a non-zero generalized derivation of R, $f(x_1,..,x_n)$ a non-central multilinear polynomial over C in n non-commuting variables, $a \in R$ such that $a[\delta(f(r_1,..,r_n)),f(r_1,..,r_n)]=0$, for any $r_1,..,r_n \in R$. Then one of the following holds: 1. $a=0$; 2. there exists $\bullet \in C$ such that $\delta(x)=\bullet x$, for all $x \in R$; 3. there exist $q \in U$ and $\bullet \in C$ such that $\delta(x)=(q+\bullet)x+xq$, for all $x \in R$, and $f(x_1,..,x_n)^2$ is central valued on R.

Key Words: Prime rings, derivations, left Utumi quotient rings, two-sided Martindale quotient ring, differential identities