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# *$f$-derivations on rings and modules*

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**Abstract:** If $\tau$ is a hereditary torsion theory on $\mathbf{Mod}_R$ and $Q_\tau : \mathbf{Mod}_R \to \mathbf{Mod}_R$ is the localization functor, then we show that every $f$-derivation $d : M \to N$ has a unique extension to an $f_\tau$-derivation $d_\tau : Q_\tau(M) \to Q_\tau(N)$ when $\tau$ is a differential torsion theory on $\mathbf{Mod}_R$. Dually, it is shown that if $\tau$ is cohereditary and $C_\tau : \mathbf{Mod}_R \to \mathbf{Mod}_R$ is the colocalization functor, then every $f$-derivation $d : M \to N$ can be lifted uniquely to an $f_\tau$-derivation $d_\tau : C_\tau(M) \to C_\tau(N)$.

**Keywords:** torsion theory, differential filter, localization, colocalization, $f$-derivation
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