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Top local cohomology, Matlis duality and tensor products

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Abstract

Let $\mathfrak{a}$ be an ideal of a local ring $(R, \mathfrak{m})$ with $d = \dim R$. This talk is two folded:

Of particular interest are the so-called top local cohomology modules, that is, $H^t_{\mathfrak{a}}(R) \neq 0$ where $H^i_{\mathfrak{a}}(R) = 0$ for all $i > t$. In the light of a result of Huneke and Lyubeznik, vanishing of the local cohomology modules $H^i_{\mathfrak{a}}(R)$, for $i = d, d-1$ paving the ground for connectedness results. $H^d_{\mathfrak{a}}(R)$ has been understood well. In this talk we express some properties of $H^{d-1}_{\mathfrak{a}}(R)$.

Next we examine the Cohen-Macaulayness of $D(H^d_{\mathfrak{a}}(R))$, Matlis dual of $H^d_{\mathfrak{a}}(R)$ where $d > 2$. Then $H^d_{\mathfrak{a}}(R) \otimes H^d_{\mathfrak{a}}(R)$, $D(H^d_{\mathfrak{a}}(R)) \otimes D(H^d_{\mathfrak{a}}(R))$ and $H^d_{\mathfrak{a}}(R) \otimes D(H^d_{\mathfrak{a}}(R))$ are examined. In particular, we give the necessary and sufficient condition for Cohen-Macaulayness of $D(H^d_{\mathfrak{a}}(R)) \otimes_{R/Q} D(H^d_{\mathfrak{a}}(R))$, where Q is a certain ideal of R.