1015-13-93 Andrew R. Kustin* (kustin@math.sc.edu), Mathematics Department, University of South Carolina, Columbia, SC 29208, and Adela N. Vraciu. Socle degrees of Frobenius powers. Preliminary report.
Theorem. Let $k$ be a field of positive characteristic $p, q=p^{e}$ for some positive integer e, $P$ be a positively graded polynomial ring over $k$, and $R=P / C$ be a complete intersection ring with $C$ generated by a homogeneous regular sequence. Let $\mathfrak{m}$ be the maximal homogeneous ideal of $R, J$ be a homogeneous $\mathfrak{m}$-primary ideal in $R$, and $I$ be a lifting of $J$ to $P$. Let $\ell$ be the dimension of the socle $(J \mathfrak{m}) / J$ of $R / J$ and $d_{1}, \ldots, d_{\ell}$ be the degrees of the generators of the socle. Then the following statements are equivalent:
(a) $\operatorname{pd}_{R} R / J<\infty$,
(b) the socle $\left(J^{[q]} \mathfrak{m}\right) / J^{[q]}$ of $R / J^{[q]}$ has dimension $\ell$ and the degrees of the generators are $q d_{i}-(q-1)$ a, for $1 \leq i \leq \ell$, where a denotes the a-invariant of $R$,
(c) $(C+I)^{[q]}\left(C^{[q]} C\right)=C+I^{[q]}$, and
(d) $I^{[q]} \cap C=(I \cap C)^{[q]}+C I^{[q]}$.
(Received January 28, 2006)

