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NONCLASSICAL GORENSTEIN CURVES

E. BALLICO AND A. COSSIDENTE

1. Introduction. Let $\mathcal{C}$ be a complete irreducible algebraic curve of arithmetic genus g, defined over an algebraically closed field $\mathbf{K}$ of characteristic $p > 0$.

Let $\hat{\mathcal{C}}$ be its nonsingular model. Let D be a canonical positive divisor of the curve $\mathcal{C}$, and let $d_0, d_1, \dots, d_{g-1}$ be a basis of the space $H^0(\mathcal{C}, D)$. The canonical morphism

$$(d_0, d_1, \dots, d_{g-1}) : \hat{\mathcal{C}} \longrightarrow \mathbf{P}^{g-1},$$

is uniquely determined by $\mathcal{C}$ up to projectives.

We will always assume that $\mathcal{C}$ is a *Gorenstein curve*, i.e., the canonical morphism induces a morphism $\mathcal{C} \to \mathbf{P}^{g-1}$, and that $\mathcal{C}$ is not *hyperelliptic*, i.e., the canonical morphism induces an isomorphism of $\mathcal{C}$ onto a curve in $\mathbf{P}^{g-1}$. Let $\{b_i\}$, $0 \leq i \leq g-1$, be the generic Hasse sequence of invariants of $\mathcal{C}$. Hence $b_0 = 0$ and b_i, $1 \leq i \leq g-1$, is the intersection multiplicity at a general point $Q \in \mathcal{C}$ of the i-dimensional linear subspace of $\mathcal{C}$ at Q. It follows that $b_i \geq i+1$ and $b_{i-1} < b_i$ for every i. If $p = 0$, then $b_i = i$ and $\mathcal{C}$ is said to be *classical*; otherwise $\mathcal{C}$ is said to be *nonclassical*. For further information, see [**23**].

The curves of genus smaller than three or, more generally, hyperelliptic curves are always classical Gorenstein curves. In the nonsingular case, the nonclassical curves of genus three and four have been classified by Komiya [**14**]. In [**9**], the authors extended the classification list by Komiya to nonclassical Gorenstein curves of arithmetic genus three and four. In [**18**], among other results, Rosa classified the nonclassical trigonal Gorenstein curves of genus g when $\operatorname{char}\mathbf{K} = g-1$, $g-2$ or $g-3$. If $\operatorname{char}\mathbf{K} = 2$, she completely solved the case $g = 2^n + 1$, too. See also [**16**], [**17**].

Our aim here is to extend (under suitable assumptions) the classification by Freitas and Stöhr to nonclassical Gorenstein curves of arithmetic genus g by at least 5. We do not give equations of the curves,

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