equivalent to a multiple of the unique g^1_2. In particular, for the canonical divisor $\mathcal{K}$ we have $\mathcal{K} \sim (g-1) \cdot g^1_2$. Conversely, the Riemann-Roch theorem shows that any divisor $D \sim r \cdot g^1_2$, where $1 \leqslant r \leqslant g-1$, satisfies $\dim |D| = \frac{1}{2} \deg D$. To see this, note that the proof of part (3) shows that if $D \sim r \cdot g^1_2$ I can write

$$D \sim (P_1 + \pi P_1) + (P_2 + \pi P_2) + \dots + (P_r + \pi P_r)$$

for a disjoint set of points $\{P_1, \dots, P_r\}$. Then

$$L(\mathcal{K} - D) = L\big(\mathcal{K} - \sum_{i=1}^{r} (P_i + \pi P_i)\big) = \bigcap_{1}^{r} L(\mathcal{K} - P_i)\,.$$

By lemma 3 this set has dimension $g - r$; in other words, $\dim |\mathcal{K} - D| = g - r - 1 = \frac{1}{2} \deg(\mathcal{K} - D)$. By lemma 1, $\dim |D| = \frac{1}{2} \deg D$.

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William J. Gordon

Department of Mathematics
State University of New York at Buffalo
Buffalo, New York 14214