

1120-13-195

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Let X be a set of points in $\mathbb{P}^1 \times \mathbb{P}^1 \times \mathbb{P}^1$. We describe how geometric information about X is encoded into the Hilbert function H_X . We introduce some new results about the Hilbert functions of points X in $\mathbb{P}^1 \times \mathbb{P}^1 \times \mathbb{P}^1$, which can be scaled to $\mathbb{P}^1 \times \cdots \times \mathbb{P}^1$. (joint paper with A. Van Tuyl) (Received February 22, 2016)