Math 641, Fall 1999
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Exercise Set 3, * exercises due Friday, October 15, 1999

* 1. Let $C$ be the Hamming code over $F_q$ with parameters $n = (q^r - 1)/(q - 1)$, $k = n - r$ and $d = 3$. Define the $q$-ary simplex code to be the dual of $C$. Prove that the minimum distance of the $q$-ary simplex code is $q^{r-1}$ and find its weight distribution. Also show that the $q$-ary simplex code meets the Griesmer bound.

* 2. Consider the linear code $C$ over $Z_5$ with generator matrix

$$
\begin{bmatrix}
1 & 0 & 4 & 2 & 3 & 1 \\
0 & 1 & 4 & 1 & 0 & 2
\end{bmatrix}.
$$

(i) Find the weight distribution of $C$.

(ii) Apply the MacWilliams identity to obtain the weight distribution of $C^\perp$.

* 3. Prove that all binary simplex codes of dimension at least 3 are self orthogonal.