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Quasi-quadratic residue codes and their weight distributions.

In coding theory, quasi-quadratic residue codes have nice properties including being self-dual when $p \equiv 3 \pmod{4}$ and having surprising good minimum distances when $p \equiv 3 \pmod{8}$. They initially drew attention because they give critical cases in testing Goppa's conjecture, which says Gilbert-Varshamov bound should be tight for binary linear codes.

In the study of these codes, we found their weight polynomials have interesting patterns, and the structure of the codes can be studied using quadratic residue codes when $p \equiv 7 \pmod{8}$. The weight distribution of these codes are asymptotically normal, and the weight of their codewords count the number of points on corresponding hyperelliptic curves. This enables us to give similar results on the asymptotic behavior of point distributions on the corresponding hyperelliptic curves. (Received August 29, 2016)