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A Class of Permutation Binomials over Finite Fields

Let q a prime power and $f = ax + x^{2q-1}$, where $a \in \mathbb{F}_q^*$. It was recently conjectured that f is a permutation polynomial of \mathbb{F}_{q^2} if and only if one of the following holds: (i) $a = 1$, $q \equiv 1 \pmod{4}$; (ii) $a = -3$, $q \equiv \pm 1 \pmod{12}$; (iii) $a = 3$, $q \equiv -1 \pmod{6}$. We will confirm this conjecture. We will also describe the context from which this conjecture arose.