1116-VE-2341 **Douglas D Knowles*** (ddk4@geneseo.edu), 11 Town Pump Circle, Spencerport, NY 14559.
Numerical Ranges over Finite Fields.

Let p be a prime number congruent to 3 modulo 4. We will work in the finite field $\mathbf{F}_p[i] = \{a + bi \mid a, b \in \mathbf{F}_p\}$, where $\mathbf{F}_p = \{0, 1, ..., p-1\}$ and $i = \sqrt{p-1} = \sqrt{-1}$. Let A be a matrix with entries from $\mathbf{F}_p[i]$. Let $\bar{x}^T$ denote the conjugate transpose of x. Consider a number $k \in \mathbf{F}_p$. Let S_k be the set of all vectors x with entries in $\mathbf{F}_p[i]$ where the product $\bar{x}^T x = k$. The author has created a definition of a new concept, the k-numerical range $W_k(A)$, which is the set of numbers of the form $\bar{x}^T Ax$, for all x in S_k. We investigate the properties of these k-numerical ranges, and explore the fundamental differences between $W_0(A)$ and $W_k(A)$ for nonzero k. We will then discuss our pioneering work in classifying the shapes $W_1(A)$ can take. This includes the author's proof that $W_1(A)$ can be a union of pairwise disjoint lines.

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