1163-47-1006 **Thomas Peebles*** (tpeebles@albany.edu) and **Michael Stessin** (mstessin@albany.edu).
Spectral Hypersurfaces for Operator Pairs and Hadamard Matrices.

Given a pair of $n \times n$ matrices A and B, if they have a projective joint spectrum $\sigma(A, B, AB, I)$ is $\{[x, y, z, t] \in \mathbb{CP}^3 : x^n + y^n + (-1)^{n-1} z^n - t^n = 0\}$ then this pair is unitary equivalent to a pair associated with a complex Hadamard matrix. Since there is a complete description of Hadamard matrices of order $n = 3, 4, 5$, we give a list of those that generate the pair. Furthermore, if we consider the projective joint spectrum of $\sigma(A, B, AB, BA, I)$ and it is of the form $\{[x, y, z_1, z_2] \in \mathbb{CP}^4 : x^n + y^n + (-1)^{n-1}(e^{2\pi i} z_1 + z_2)^n - t^n = 0\}$ then the Hadamard matrix is exactly the Fourier matrix F_n. Under some mild conditions, we can extend these results to pairs of operators on a Hilbert space. (Received September 14, 2020)