1060-20-195   **Jane Gilman*** (`gilman@rutgers.edu`), Mathematics Department, Smith Hall, Rutgers University, Newark, NJ 07102. *Rank two free groups and the non-Euclidean Euclidean algorithm.*

Let $G = \langle A, B \rangle$ be a two generator group free group and let $\rho : G \to PSL(2, \mathbb{R})$ be a non-elementary representation. The *discreteness algorithm* determines whether or not $\rho(G)$ is a discrete group. It has both a geometric and an algebraic formulation. It finds a geometrically unique pair of primitive generators when the image is discrete and by work of Gilman and Keen can be used to give an enumeration scheme for all primitive pairs of generators in any rank two free group. In this talk we re-interpret the geometric algorithm as an algorithm in the hyperbolic plane that uses non-Euclidean distance. That is, we interpret this algorithm as a type of *Euclidean Algorithm* using the non-Euclidean distances that $\rho(A)$ and $\rho(B)$ have as their translation lengths when the images are hyperbolic. The *geometric discreteness algorithm* becomes a *non-Euclidean Euclidean algorithm*. We show how this formulation of the algorithm simplifies the Gilman-Jiang proof of polynomial time complexity. (Received March 30, 2010)