1035-15-1905 **Jason Grout*** (grout@iastate.edu), 396 Carver Hall, Department of Mathematics, Iowa State University, Ames, IA 50011. *The minimum rank problem over finite fields.* Preliminary report.

We consider all symmetric $n \times n$ matrices with a fixed off-diagonal zero/nonzero pattern Z. The minimum rank for the pattern Z is the minimum rank of all such matrices. It is known that, for each rank k between the minimum rank of Z and n, there are symmetric matrices having the zero/nonzero pattern Z and rank k. Determining the minimum rank of a pattern is the important, but difficult question. Working with matrices over a finite field simplifies and gives insight into the problem over an infinite field.

Each zero/nonzero pattern corresponds to an undirected graph in a natural way, thus defining the minimum rank of a graph. We will characterize the structure of all graphs having minimum rank at most k over a finite field with q elements for any possible k and q. A strong connection between this characterization and polarities of projective geometries will be explained. Using this connection, a few results in the minimum rank problem will be derived by applying some known results from projective geometry. (Received September 20, 2007)