

1096-47-1535 **scott a mccullough*** (sam@uf1.edu). *Noncommutative Inequalities*. Preliminary report.

The talk will cover aspects of inequalities for non-commutative functions in free $*$ -algebras. At this point we have:

- A. Free $*$ -algebra versions of the classical real algebraic geometry description, or positivstellensatze (resp. nullstellensatze), which provides an algebraic certificate for a polynomial q to take positive definite (resp. zero) values on the set where another, q , takes positive definite (resp. zero) values;
- B. Classifications of convex rational functions, varieties and open sets. There are shockingly few;
- C. An emerging picture of free convex hulls and projections of free semi-algebraic sets;
- D. Some theory of changes of variables to achieve non-commutative convexity and the relationship to positivstellensatze;
- E. Other.

The work originates in trying to develop some theory for studying the matrix inequalities which are ubiquitous in linear engineering systems and control. The talk will select a topic from the list above and will be co-ordinated with the speaker's collaborators who are in attendance. (Received September 16, 2013)