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Noncommutative Inequalities

J. William Helton and Scott A McCullough

The talk concerns inequalities for non-commutative functions. At this point we have for free $*$ -algebras:

A. versions of the classical real algebraic geometry description of when one polynomial p is nonnegative on the domain where another polynomial q is nonnegative. Recent advances are in conjunction with Igor Klep and Chris Nelson.

B. classification of convex non-commutative polynomials, rational functions and varieties. There are shockingly few of these.

C. Some theory of changes of variables to achieve non-commutative convexity (due to Helton Klep McCullough Popescu).

D. other.

The talk will select a topic from this. The work originates in trying to develop some theory for studying the matrix inequalities which are ubiquitous in linear engineering systems and control. (Received September 24, 2012)