1154-47-1847 **Michael Jury**, **Igor Klep**, **Mark E. Mancuso** and **Scott McCullough*** (`sam@ufl.edu`), Department of Mathematics, University of Florida, Gainesville, FL 32611-8105, and **James E. Pascoe**. *Partial Matrix Convexity.* Preliminary report.

Linear Matrix Inequalities (LMIs), matrix convex sets and matrix convex free polynomials are related by the facts that a free set is matrix convex if and only if it is determined by LMIs; a free polynomial is matrix convex if and only if it has an LMI inspired algebraic certificate; and the positivity set of a matrix concave free polynomial is matrix convex. In this talk we will introduce a framework for generalizing these ideas to various notions of partial convexity, focusing most of our attention on the case of Bimatrix Inequalities (BMIs) and the corresponding notions of xy-matrix convex sets and xy-matrix convex polynomials. Given two sets of freely noncommuting variables $x = (x_1, \dots, x_g)$ and $y = (y_1, \dots, y_h)$, a monic xy-pencil is an expression of the form

$$L(x,y) = I + \sum A_j x_j + \sum B_k y_k + \sum C_{p,q} x_p y_q + \sum C_{p,q}^* y_q x_p.$$

Here the $A_j, B_k, C_{p,q}$ are matrices, A_j and B_k are selfadjoint, and of course I is the identity matrix. The pencil L is naturally evaluated at a tuple $(X,Y) = (X_1, \dots, X_g, Y_1, \dots, Y_h)$ of matrices of the same size using the Kronecker tensor product giving output $L(X,Y)$. The inequality (in the Loewner ordering) $L(X,Y) \succeq 0$ is a Bimatrix Inequality (BMI). (Received September 16, 2019)