MARK GIRARD, Institute for Quantum Science and Technology - University of Calgary
On Convex Optimization Problems in Quantum Information

The evaluation of many important quantities in quantum information theory involves finding the solution to a convex optimization problem, usually in the form of minimizing a convex function over a convex subset of hermitian matrices. For example, determination of the relative entropy of entanglement (REE) for an arbitrary quantum state ρ amounts to minimizing the relative entropy of ρ with respect to the convex set of separable states. While finding closed fomulae solutions to such convex optimization problems is usually impossible, solving the converse problem is often instructive and enlightening in regard to the original problem. That is, given a family of convex functions and a state σ on the boundary of a subset of hermitian matrices, we can find all functions whose minimum value is achieved at σ. In particular, this allows us to determine explicit expressions for the REE and its variants, such as the Rains bound. This approach also elucidates interesting facts about these quantities, such as, among others, that the Rains bound reduces to the REE when at least one subsystem is a qubit.