

Spectral sets and derivatives of the psd cone

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A spectrahedron is the solution set to a linear matrix inequality. Consider a spectrahedral cone K in n -space which is symmetric with respect to permuting the coordinates. According to an observation by Bauschke, Güler, Lewis and Sendov the set $S(K)$ of all symmetric $n \times n$ matrices, whose spectrum is in K , is a hyperbolicity cone. We give a representation theoretic sufficient condition on K for $S(K)$ being a spectrahedral cone. Applying this to Brändén's spectrahedral representation of elementary symmetric polynomials yields a spectrahedral representation of all derivative relaxations of the cone of positive semidefinite matrices.