Two proofs of Størmer's theorem

Tuesday October 20 – 16h15-17h00

S. Szarek

The structure of the set of positivity-preserving maps between matrix algebras is notoriously difficult to describe. The notable exceptions are the low dimensional cases settled by Størmer and Woronowicz, which are equivalent to the Peres-Horodecki positive partial transpose criterion being able to determine whether a state in a 2×2 or 2×3 quantum system is entangled or separable. However, even in these cases the existing arguments (known to the speaker) are based on seemingly ad hoc and long computations. We show a simple argument – based on Brouwer's fixed point theorem – for the 2×2 case (Størmer's theorem), and sketch another argument – following the classical outline, but highly streamlined – based on characterization of extreme self-maps of the Lorentz cone. (Based on joint work with G. Aubrun.)