1163-81-418 **Adam Bene Watts** and **Bill Helton*** (helton@math.ucsd.edu). *3XOR games with perfect quantum strategies.*

Computing the entangled value of a kXOR game amounts to optimizing a particular k linear noncommutative hermetian function b of hermetian operators S_j on Hilbert space H satisfying $S_j^2 = I$ and simple commutation relations. Always $b \preceq I$ and a set S of S_j making $\|b(S)\| = 1$ is called a perfect "quantum strategy". This paper concerns 3XOR in the case where a perfect Qstrategy exists. Tsirelson completely handled Qstrategies for two players, 2XOR, in 1987. Not perfect 3XOR Qstrategies have potentially ∞ advantage over classical strategies, but approximating the entangled value of 3XOR games is at least NP hard (2013), and may be undecidable. We show whether or not a 3XOR game has a perfect quantum strategy is decidable in polynomial time. We do this with a constructive proof: if a perfect Qstrategy exists, it is achievable in 8 dimensions, but the Q advantage over a classical strategy is bounded. The proof introduces an intermediate algebra $\mathcal{A}$ which satisfies the physical relations above plus the requirement that pairs S_iS_j of hermitian operators commute. Then it shows (unexpected and not easy) that $\max b$ over $\mathcal{A}$ is 1 iff the original game is perfect. (Received September 05, 2020)