Is Quantum Mechanics An Island in Theoryspace?

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Abstract

This paper investigates what happens if we change quantum mechanics in several ways. The main results are as follows. First, if we replace the 2-norm by some other p-norm, then there are no nontrivial norm-preserving linear maps. Second, if we relax the demand that norm be preserved, we end up with a theory that allows rapid solution of hard computational problems known as PP-complete problems (as well as superluminal signalling). And third, if we restrict amplitudes to be real, we run into a difficulty much simpler than the usual one based on parameter-counting of mixed states.

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