Quantum Computing

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Homework 3, due June 5

1. Recall that a two-qubit state is *entangled* if it does *not* have the form $|\phi\rangle \otimes |\psi\rangle$, where $|\phi\rangle, |\psi\rangle$ are 1-qubit states.

   Prove that there does not exist a probability distribution on **entangled** states that has the same density matrix as the basic state $|00\rangle$.

2. Alice picked an orthonormal basis in a 1-qubit space and applied the projective measurement in this basis to the pure state $|0\rangle$. After that she measured the result in the computational basis $|0\rangle, |1\rangle$, and her goal is to maiximize the probability of getting the answer 1. What is the best value she can hope for in this experiment?

3. Alice picks a mixed state ρ in a 1-qubit space, after that Bob picks another mixed state σ, and then Alice pays Bob $D(\rho, \sigma)$ dollars. Determine the value of this game, the best strategy for Alice and describe the set of best responses for Bob.