Problem set 8

8.1 Teleporting a unitary transformation

A has a qubit in the state $|\psi\rangle$ and B has a qubit in state $|\phi\rangle$. They also has a supply of shared entangled pairs, each in the state

$$|\psi^-\rangle = \frac{1}{\sqrt{2}}(|10\rangle - |01\rangle)$$

with A having the first qubit and B the second qubit of each pair. They want to perform a unitary transformation U on the two qubits, so that the final state is $U(|\psi\rangle \otimes |\phi\rangle)$. How can they achieve this? They are able to do any local unitary operation on any number of qubits, ant they are allowed to use any number of entangled pairs (how many do they need?) and communicate classically (how many bits of classical information must be exchanged?).

8.2 Midterm exam 2004, Problem 2