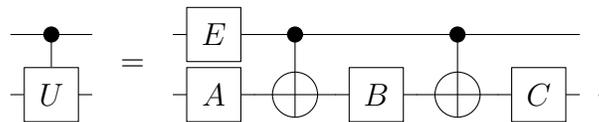**Problem Set 2**
CPSC 440/640 Quantum Algorithms
Andreas Klappenecker

The assignment is due Wednesday, September 20, before class.

Recall that for each unitary matrix $U \in \mathcal{U}(2)$ there exist matrices $A, B, C,$ and E in $\mathcal{U}(2)$ such that

1) Find the matrices E, A, B, C such that the above ciruit realizes a controlled rotation operation $U = \begin{pmatrix} \cos x & -\sin x \\ \sin x & \cos x \end{pmatrix}$.

2) Find the matrices E, A, B, and C such that the above circuit realizes a controlled Hadamard gate, that is, $U = H$.

3) Solve Exercise 3.2 in the lecture notes.

4) Solve Exercise 3.4 in the lecture notes.

Review all material on quantum gates, teleportation, Deutsch's problem, and the small search algorithm.