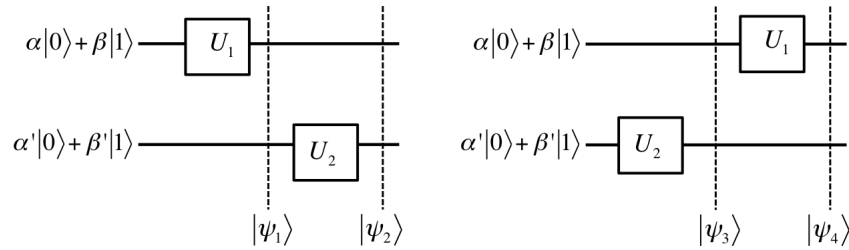


Name: \_\_\_\_\_

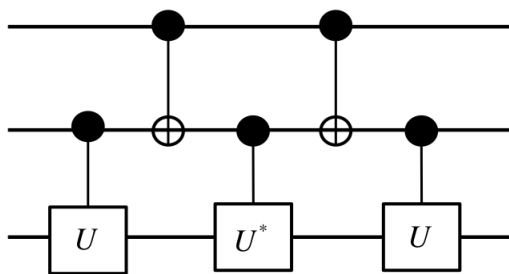
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There are 3 questions for a total of 10 points.

1. (3 points) Let the matrix representation of gates  $U_1$  and  $U_2$  be  $U_1 = \begin{bmatrix} p & q \\ r & s \end{bmatrix}$  and  $U_2 = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ . Give the states  $|\psi_1\rangle, |\psi_2\rangle, |\psi_3\rangle, |\psi_4\rangle$  in the circuits below.



2. (2 points) What is the input-output behaviour of the following circuit. ( $U^*$  denotes conjugate transpose.)



Input	Output
$ 00\rangle \psi\rangle$	
$ 01\rangle \psi\rangle$	
$ 10\rangle \psi\rangle$	
$ 11\rangle \psi\rangle$	

3. (5 points) Give the the intermediate states  $|\psi_0\rangle, |\psi_1\rangle, |\psi_2\rangle, |\psi_3\rangle$  of the 3-qubit circuit given below. Show your calculations.

