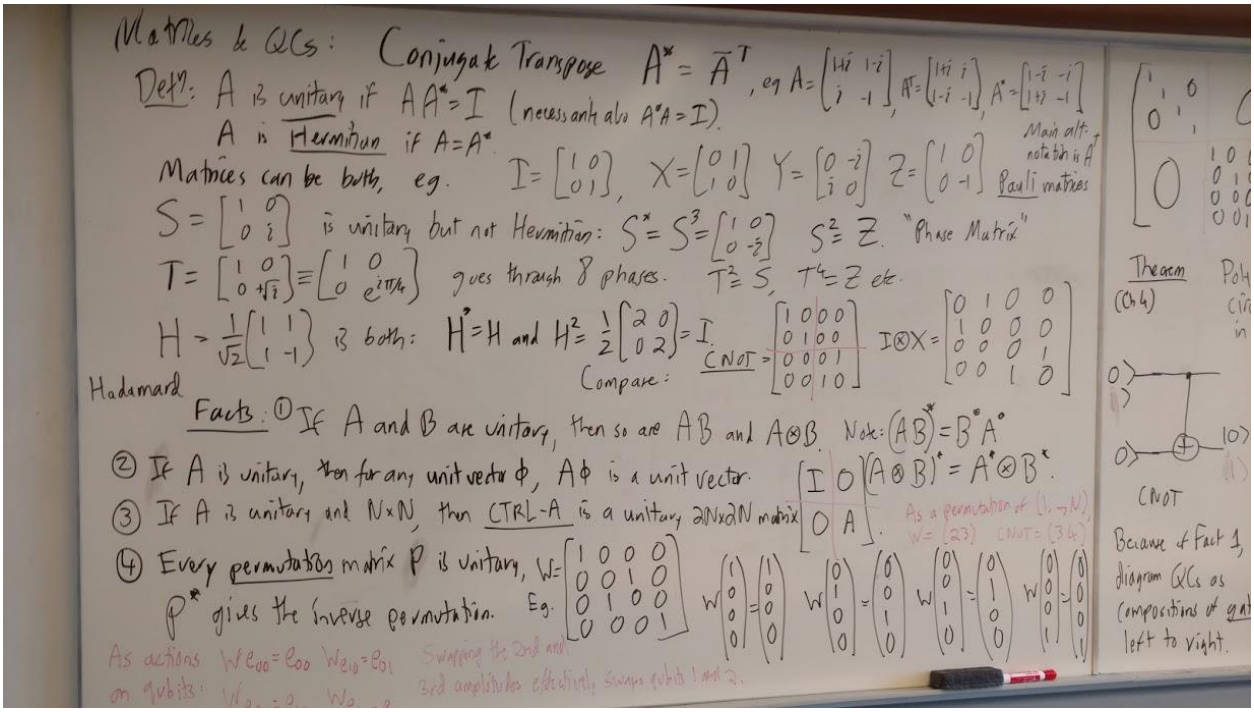
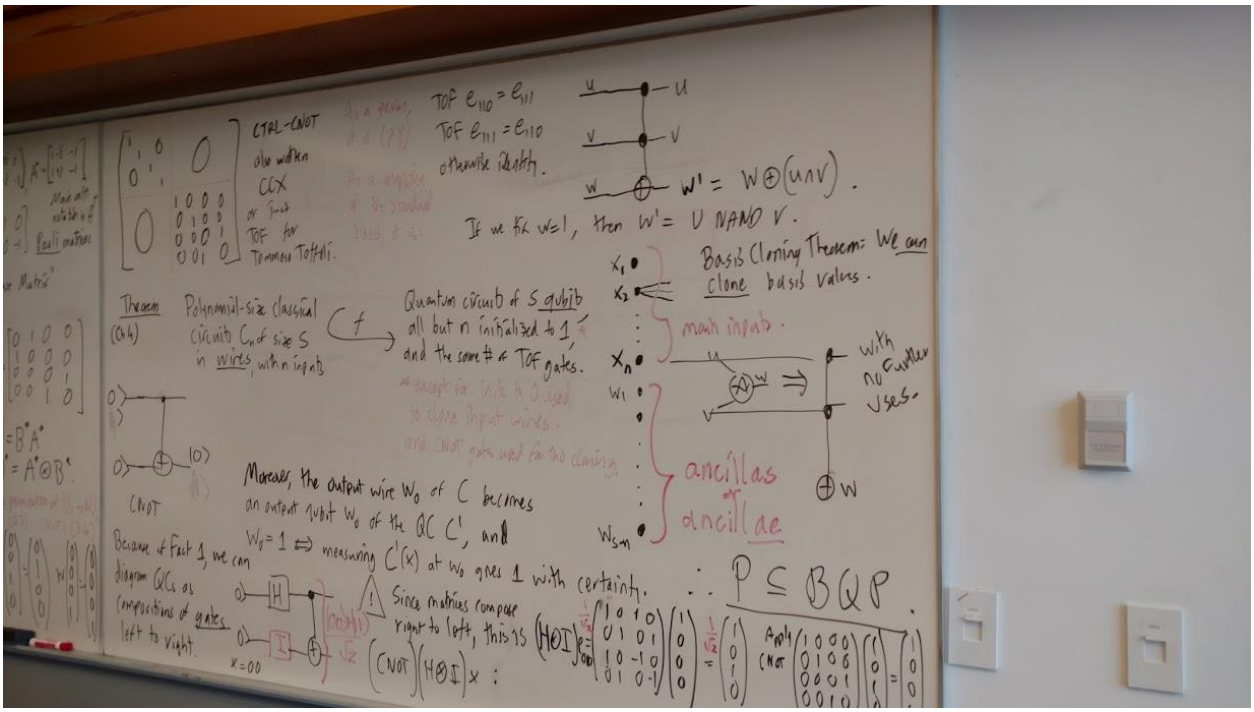
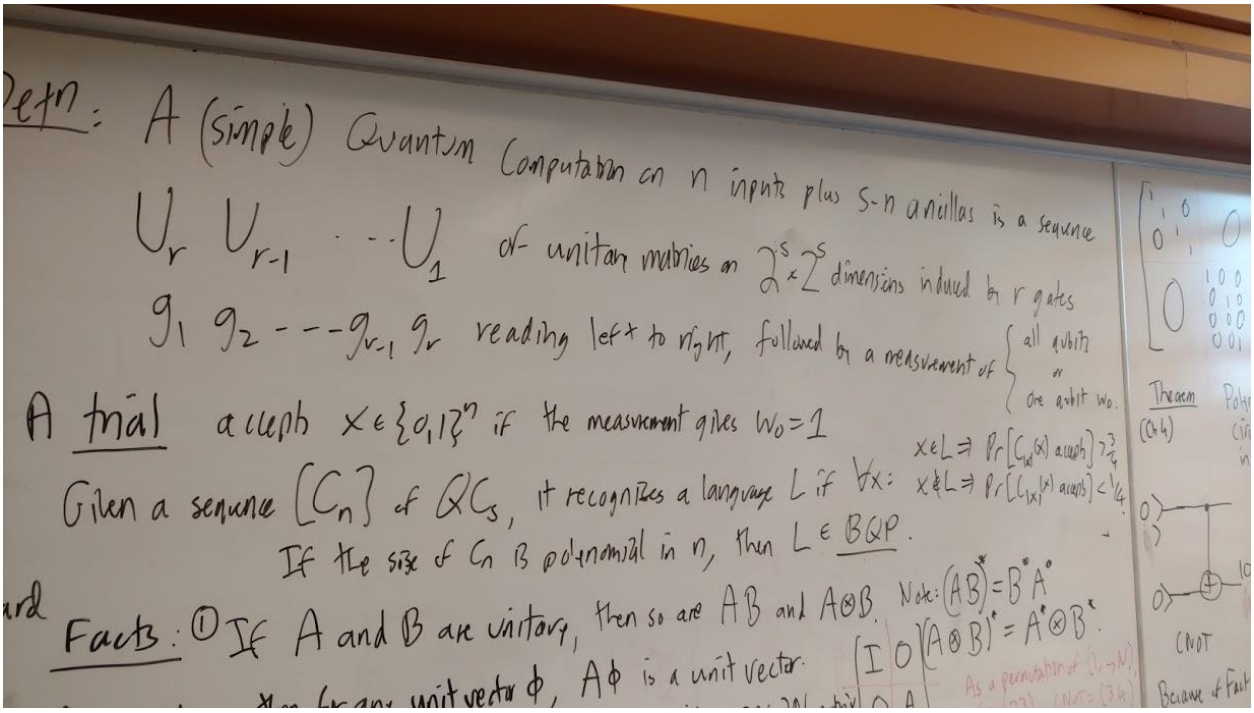
CSE596 Lecture Tue. Dec. 3 (made up from 11/22)





The red at top center says, "As a permutation, TOF = (7 8). As a mapping of the standard basis it is: …" ---then follows the part to its right in black. The red in the middle notes that to represent multiple wires w out of an input gate x_i, we need to make the ancilla qubit for w have the same value of x_i, so we initialize w to 0 not 1 and make it the target of a CNOT with x_i as source. *Basis* inputs *can* be cloned.



I intended to finish by stating the *amplification theorem* for BQP and BPP both: If you have a language L that belongs to BQP (respectively, BPP) via a predicate R(x,y) where

X is in L ➔ Pr_y[R(x,y) > 2/3

X notin L ➔ Pr_y[R(x,y) < 2/3,

then for any m one can define R'(x,Y) where Y is a tuple of m strings to hold if the *majority* of R(x,y_j) values hold, 1 <= j <= m. This gives

X is in L ➔ Pr_y[R(x,y) > 1 – 1/g(m)

X notin L ➔ Pr_y[R(x,y) < 1/g(m),

Where the function g(m) is exponential in m. In particular, with m = O(log n), one can get "> 1 – 1/3n" and "< 1/3n" in the two branches as stated in problem (1) of HW6. You can get "> 1 – 1/6n" and "< 1/6n" if you want, or "> 1 – 1/n^3" vs. "< 1/n^3" or whatever. This is called "amplification by majority vote" and is a powerful technique.