Problem Set #7

Quantum Error Correction
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Due Tuesday, Mar. 20, 2012.

Problem #1. Gates By Braiding

a) Write the following braid in terms of generators of the braid group:

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1 2 3 4
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b) In the Fibonacci anyon model, consider 4 quasiparticles with total charge 1. They have a 3 dimensional Hilbert space. Write down a basis for the Hilbert space, labelling the basis states 0, 1, and 2 for use in part c.

c) Calculate for the basis determined in part b the unitary performed by the braid from part a.

Problem #2. Existence of Strings in 2D (Bonus)

Consider a stabilizer code with local generators on a square $L \times L$ lattice of qubits with periodic boundary conditions. (I.e., on a torus.) Show that, if the distance $d \sim L$, all logical operations can be supported on a network of strings of constant size (width).