Combinatorial Geometry
Problem Set Number Three, for You and Me

Instructions: Again, do any two of these problems. They're due in a week (Feb 17).

(1) Finish (and write up, with complete proofs) Questions 4-6 of the "Euler's Formula and the Torus" handout. Actually, if you answer and give a complete proof of Question 6, it'll supersede Questions 4 and 5, so 6 is the only one you really need to write up.

(2) Make a PHiZZ Unit torus of any size you want. Your write up should include (1) the graph of your torus drawn on the torus fundamental domain and (2) a description of your attempt to 3-edge color it. Then bring it into class to show me. Yeah!

(3) The **complete graph on n vertices**, K_n, is the graph made by taking n vertices and drawing edges between them in all possible ways. What is the largest n for which K_n can be properly drawn on the surface of a torus?

(4) Find an example of a planar graph which has chromatic number 4 (the vertices need 4 colors to be colored properly) and which has no triangle faces touching each other (sharing vertices).

(5) The below graph is called the **Tutte graph**. Does it have a Hamilton circuit? If yes, find one. If no, prove it.