Math 110 – Mathematical Explorations
Block 4 2005
Individual Problems #4, due Friday, December 16

Please explain your solutions clearly, and provide justification for all your claims. You may consult your notes and the textbook, and you may use a calculator or computer algebra system if you like. You may not discuss these problems with any person other than me, and you may not consult other books. If you have questions, please come talk to me during my office hours, or at some other more convenient time for you.

1. Section 4.6: 32–35

2. A number of lower-case Greek letters are shown below. Assume that the letters are formed from one-dimensional curves with no thickness. Group the letters into groups that are topologically equivalent. To do this, you must:

   - Provide pictures for each group that show that every letter in that group is topologically equivalent to every other letter in that group.
   - Find a topological invariant that distinguishes every pair of distinct groups.

$$\alpha\gamma\delta\epsilon\eta\theta\kappa\mu\pi\rho\sigma\chi\psi$$

3. Two graphs G and H are ***isomorphic*** (the word used for equivalent when talking about graphs) if there is a one-to-one correspondence between the vertices of G and the vertices of H, such that there is an edge between two vertices in G if and only if there is an edge between the corresponding vertices in H. Show that the following graphs are all isomorphic by labelling the vertices of the two unlabelled graphs with the letters a through j. These graphs are called the *Petersen graph*.