Computational Topology (Spring 2018) — Homework 3

- You **must email your submission** as a **PDF file** to bkrishna@math.wsu.edu. You are welcome to write answers by hand, and scan or take photos of the writings. Put all the images on a PDF file, though.

- Your file name should identify you. For instance, if you are Napolean Dynamite, you should name your submission NapoleanDynamite_Hw3.pdf. **Please start your name in this format. If you want to add more bits to the title, e.g., Math574, you could name it NapoleanDynamite_Math574_Hw3.pdf, for instance. Also, please avoid white spaces in the file name :-).**

- **This homework is due before midnight on Thursday, February 15**.

The set of triangles in a 2-complex is given in the file Triangles.txt. The $\{x, y, z\}$ coordinates of the vertices used in the triangles are given in the file Vertices.txt. The vertex labels as used in the list of triangles correspond to the line numbers in the file Vertices.txt. So, the coordinates of the three vertices in the triangle $[v_3, \ v_{256}, \ v_{145}]$ (specified in a single line as [3, 256, 145]) are listed in lines 3, 256, and 145, respectively, in the vertex coordinates file.

1. (20) Find the Euler characteristic of the given 2-complex. Explain how you are finding the (list of) vertices and edges (so as to count the numbers of them).

2. (30) Is the 2-complex a surface? If not, could you make it a surface by adding a few missing triangles?

3. (50) Assuming you have a surface from the previous step, can you orient the surface? You could try to propagate a chosen orientation from a single triangle to all other triangles. What standard surface, if any, is this one homeomorphic to?

4. (30) Produce a few views of the patched up surface using TetView, or another meshing software (or in Octave or Python). Include these views as images in your report.