

**Homework #4**

Assigned: Wednesday, 10/3

Due: Wednesday, 10/17.

*This assignment covers O'Rourke textbook material in Chapter 5,  
and de Berg et al. Chapters 7 and 9,  
plus CGAL documentation.*

1. (25 points) O'Rourke, Exercise 5.3.3(5) on p. 164: *Average number of Voronoi polygon edges.* (This is similar to deBerg et al. Exercise 7.6(2) on p. 170.)
2. (25 points) Write a CGAL program to experimentally test the claim in problem 1 that the number of edges in a Voronoi polygon, averaged over all Voronoi regions for any set of  $n$  points, does not exceed 6. Submit a description of your experiment, a copy of your source code, and description of your results.
3. (25 points) deBerg et al. Exercise 9.7(3) on p. 215: Just the part of the exercise that asks you to prove that any 2 triangulations of a convex polygon can be transformed into each other by edge flips.
4. (25 points) Use CGAL to find the 3D Delaunay triangulation (tetrahedralization) of the following set P of points:
  1.  $P_1 = (0, 0, 0)$
  2.  $P_2 = (0, 0, 100)$
  3.  $P_3 = (50, 50, 50)$
  4.  $P_4 = (-50, -50, 50)$
  5.  $P_5 = (100, 0, 0)$
  6.  $P_6 = (0, 100, 0)$

Please use CGAL's `Delaunay_triangulation_3`. Give the number of tetrahedra that result, and print out the coordinates of each tetrahedron.

Extra Credit: Display the point set P from problem 4 using the display method of your choice, and display the edges of the resulting CGAL tetrahedra.