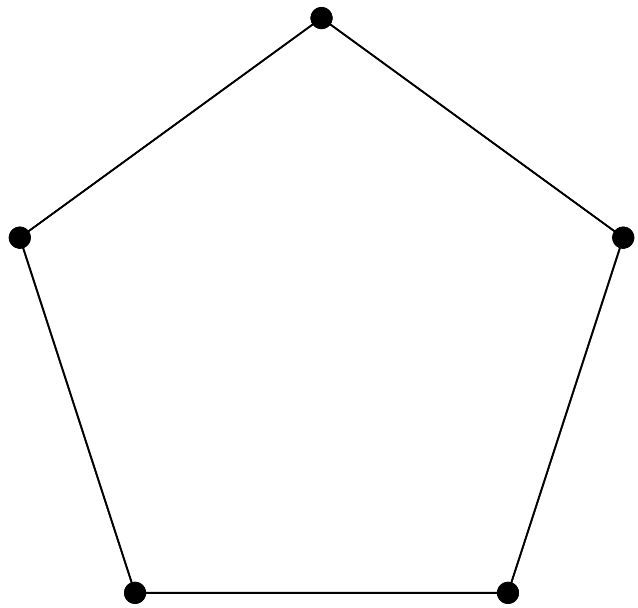
The Associahedron

Math 282 Computational Geometry

1. Recall that the flip graph of a regular pentagon can be drawn as a pentagon.

(a) Label each vertex below with a triangulation of a regular pentagon, so that the graph is the flip graph of a regular pentagon.

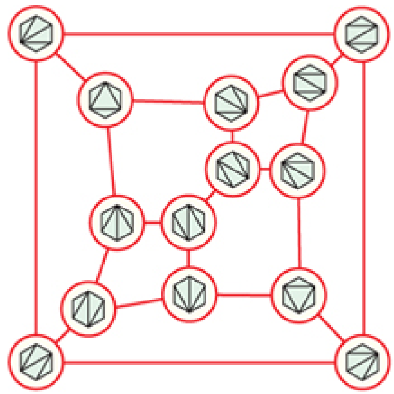


(b) Each edge in the flip graph connects two vertices are labeled with triangulations that have exactly one common diagonal. Label each edge to show its associated diagonal in a regular pentagon.

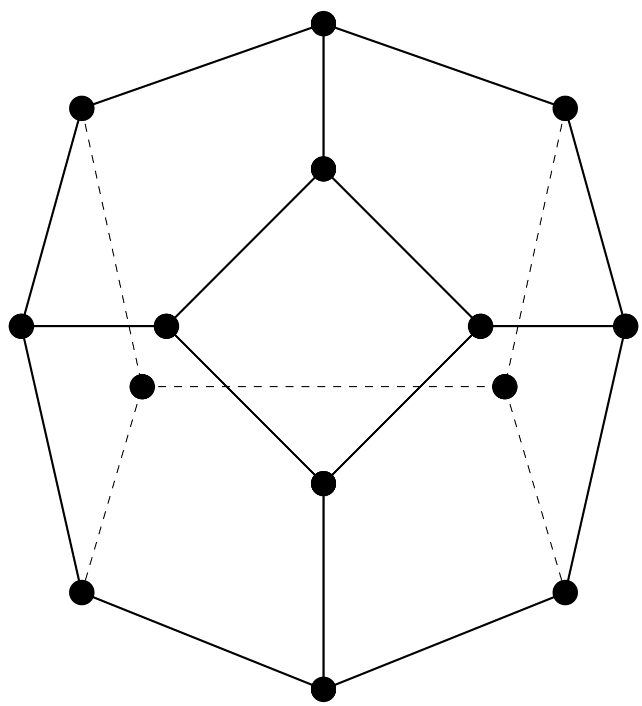
(c) List all of the ways of inserting up to two pairs of correctly-matched parentheses into *abcd* as grouping symbols.

(d) Label each vertex of the pentagon above with an arrangement of *abcd* and two sets of parentheses, and each edge with an arrangement of *abcd* and one set of parentheses, such that the parentheses corresponding to each edge also occur at the vertices of that edge.

2. The flip graph of a regular hexagon is shown below.



(a) Label each vertex of the following polyhedron with a triangulation of the hexagon such that each edge of the polyhedron corresponds to an edge flip. This shows that the vertices and edges of the polyhedron have the same structure as flip graph!



(b) How could you label the edges and faces of the polyhedron consistently with the vertex labels?

(c) List all ways of inserting up to three pairs of correctly-matched parentheses into *abcde* as grouping symbols. Can you also label the polyhedron with these arrangements, similar to how you labeled the pentagon in #1(d)?