MATH-566 HW 3

Due **Sep 16** before class. Just bring it before the class and it will be collected there.

1: (*Convex hulls*)
Let P and Q be polytopes. Show that $conv(P \cup Q)$ is also a polytope.
Find an example of polyhedra P and Q, where $conv(P \cup Q)$ is not a polyhedra.

2: (*Cyclic polytope*)
Show that for cyclic polytopes in dimension 4 and higher, every pair of vertices is connected by an edge. For dimension 4 and two arbitrary vertices, give an explicit equation of a hyperplane that is intersecting the polytope exactly in this edge.

3: (*SAGE: LP solver*)
Write a program in Sage that will solve linear programs by checking all vertices of polytope. See the template on the webpage.

4: (*Simplex and faces - not graded - just something to think about*)
Verify that if $V \subset \mathbb{R}^d$ is affinely independent, then each subset $F \subset V$ determines a face of the simplex $S = conv(V)$.