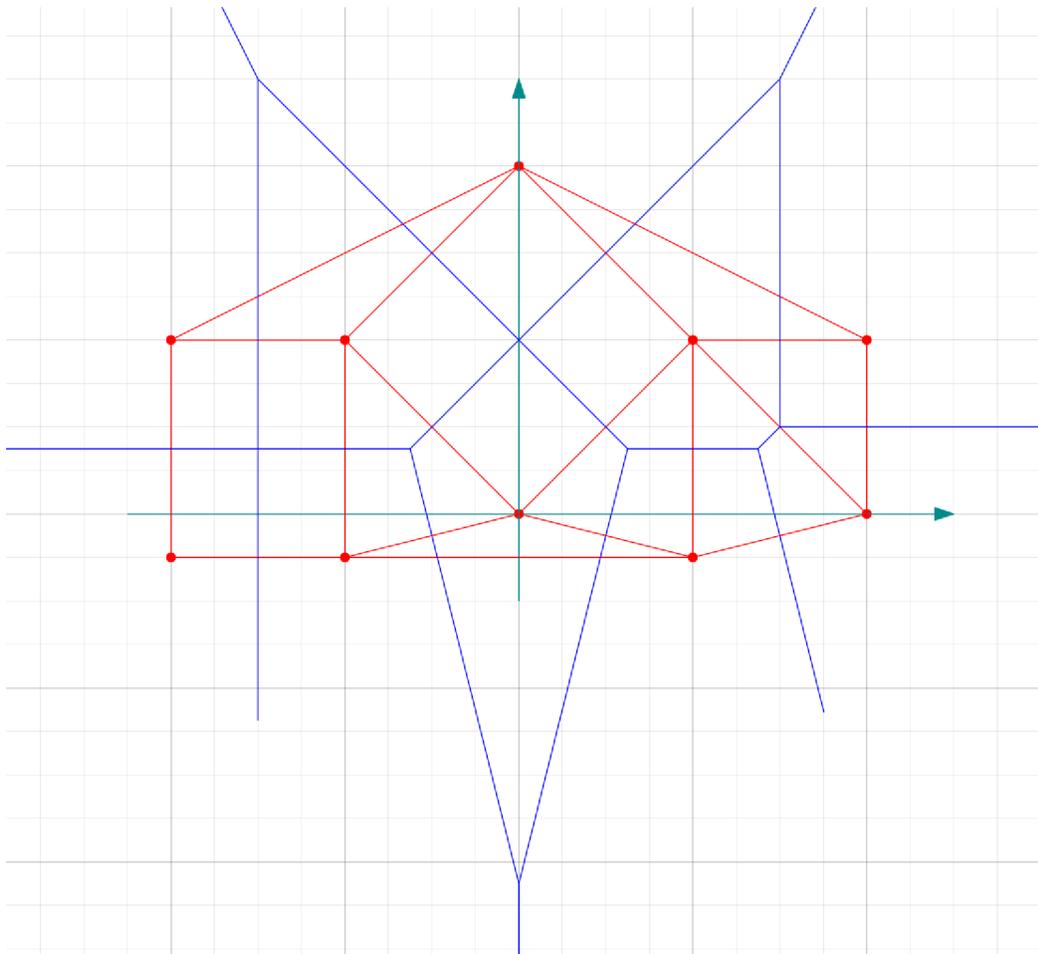


HW5

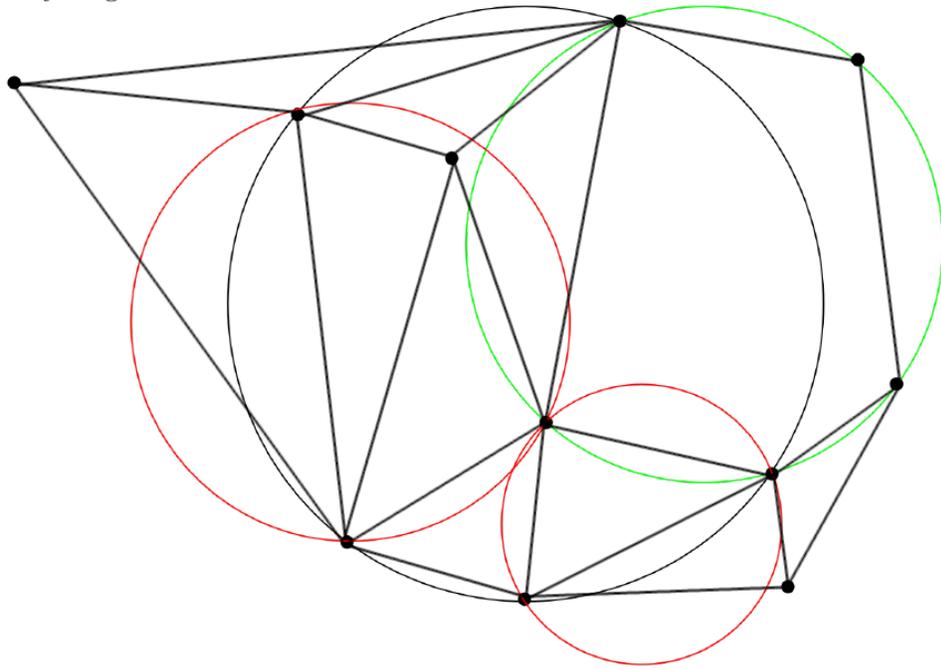
Problem 1

- 1.
 - $k = 4$: tetrahedron
 - $k = 5$: $F = 5$, $E = 7.5$ ($15 / 2$), no dot exist
 - $k = 6$: two tetrahedron merge one facet with each other
- 2.
 - $F = 4$, $E = 10$, $V = 8$, not possible, total V must less than 7 ($3 * 7 = 21 > 20$)
 - $F = 5$, $E = 10$, $V = 7$, same reason
 - Yes, cube
- 3.
 - consider four side faces as a whole 5 by 3 face, and the top/down/inside faces as 1 by 1 faces
 - $F = 4 + 21 * 2 + 4 * 8 + 12 + 8 + 4 = 102$
 - $E = 4 + 5 * 6 * 2 * 2 + 4 * 8 + 4 + 4 * 8 + 12 + 2 * 4 * 2 = 220$
 - $V = 6 * 6 * 2 + 4 * 8 = 104$
 - Euler characteristic = $104 + 102 - 220 = -14$
 - genus = $(2 - (-14)) / 2 = 8$ ($-14 = 2 - 2g$)

Problem 2



- generated by Ipe
- Delaunay edges: 18
- Voronoi edges: 18
- $|Q| = 1$: 10
- $|Q| = 2$: 18
- $|Q| = 3$: 7
- $|Q| = 4$: 2
- $|Q| = 5$: 0
- $|Q| > 5$: 0



• 2.