

Geometric Graph Theory

7. Exercise, 14. April, 2010
Wednesday 1015-1145*, MA A1 10

1. If we color the edges of K_{3n-1} with two colors, we have n monochromatic edges such that no two share an endpoint.
2. Suppose that there is a meeting among 9 people such that there are no three people who all met before. The people who have not met before shake hands.
 - a) At least how many handshakes will happen?
 - b-c) At least how many people are there such that any two shake hands?
3. Let us assume that we have n intervals of \mathbb{R} whose endpoints are different. Prove that if any two intersect, then all of their intersection is non-empty.
4. Let us assume that we have n intervals of \mathbb{R} whose endpoints are different. Prove that if no $k + 1$ intervals have a point in common, then one can color the intervals with k colors so that no two intervals from the same color class intersect.
5. (*HW*) Let us assume that we have n^2 intervals of \mathbb{R} whose endpoints are different. Prove that there is a point contained in n intervals or there are $n + 2$ intervals that are all disjoint.
Note that we did not discuss the previous two exercises, so if you use them, also include their solutions! (Consider them as hints to a possible solution.)
6. * What is the smallest number n such that coloring the vertices of K_n with three colors we must have a monochromatic triangle?

New exercises and notes can be found at <http://dgc.epfl.ch/page85509.html>
Solutions to selected homeworks should be handed in at the beginning of the next session or sent to doemoe-toer.palvoelgyi@epfl.ch.