

Assignment 12

Issue date: 10 July 2014 **Due date:** 17 July 2014, 11:00

It is explicitly recommended to solve exercises in groups of two.

Exercise 1: Density

2+4+2 Points

- (a) Prove or disprove: linear density is hereditary; that is, a subgraph has at least the same linear density as its supergraph.
- (b) Given a graph with n vertices, show that the linear density of any two subgraphs is either equal or differs by at least $\frac{1}{n(n-1)}$.
- (c) Discuss the difference of linear and quadratic density with regard to a graph consisting of nothing but two separated $|C|$ -cliques: what about inclusion-maximal subgraphs of maximum density (and what if the number of nodes $n = 2 \cdot |C| \rightarrow \infty$)?

Exercise 2: Densest subgraph

4 Points

In the lecture we discussed a greedy approach for finding the densest subgraph in a graph $G = (V, E)$ (proposition 13). However, it was mentioned that this greedy approach does not work all the time.

Come up with an instance of a graph $G = (V, E)$ and specify the the class of graphs that this instance belongs to, where the greedy approach results in finding a dense subgraph that is far from the actual densest subgraph of the graph $G = (V, E)$ by a gap of some function of n .

Please submit your answers electronically to teaching assistant Habiba (habiba@uni-konstanz.de).