ALTA
Institute for Algebra, Geometry, Topology and their Applications

Prof. Dr. Dmitry Feichtner-Kozlov
Discrete Mathematics
WS 2025/26

Exercise Set 10

Exercise 10.1 Calculate the chromatic number of the complements of the cyclic graphs.

(6 Punkte)

Exercise 10.2 (1) Let B be an arbitrary bipartite graph with at least one edge. Describe the set of all graphs G, such that there exists a graph homomorphism from G to B.

What is the set of all graphs G, such that there exists a graph homomorphism from G to *some* bipartite graph.

What is the set of all graphs G, such that there exists a graph homomorphism from G to *some* tree.

(2) What is the set of all graphs G, such that there exists a graph homomorphism from G to *some* odd cycle.

(je 3 Punkte)

Exercise 10.3 Show that $\chi_f(C_5) = 2\frac{1}{2}$.

(6 Punkte)

Exercise 10.4 Let G be an arbitrary graph and let $\overrightarrow{G}$ be a directed graph obtained from G by orienting its edges. Show that $\overrightarrow{G}$ contains a directed path with $\chi(G)$ vertices.

(6 Punkte)

Submission of the exercises: Tues, 20.01.26, before the tutorial (until 12:15) into the postbox 54 in MZH 1st floor, or submission at the beginning of the 12:30-tutorial.