

### Exercise Set 11

**Exercise 11.1** Calculate the chromatic polynomial of the complete  $m$ -partite graph

$$K_{\underbrace{2, 2, \dots, 2}_m}$$

(6 Punkte)

**Exercise 11.2** Let  $G$  be a graph with  $n$  vertices. Show that if  $P(G, t) = t(t-1)^{n-1}$ , then  $G$  is a tree.

(6 Punkte)

**Exercise 11.3** Let  $G$  be a graph with  $n$  vertices, where  $n \geq 3$ . Show that the coefficient  $\alpha_{n-2}$  of the term  $t^{n-2}$  in the chromatic polynomial  $P(G, t)$  is given by

$$\alpha_{n-2} = \binom{|E(G)|}{2} - \Delta(G),$$

where  $\Delta(G)$  denotes the number of triangles in  $G$ .

(6 Punkte)

**Exercise 11.4** Show that the following graphs are not planar

- (1) the complete graph on 5 vertices  $K_5$ ;
- (2) the complete bipartite graph  $K_{3,3}$ .

(je 3 Punkte)

**Submission of the exercises:** Tues, 27.01.26, before the tutorial (until 12:15) into the postbox 54 in MZH 1st floor, or submission at the beginning of the 12:30-tutorial.