

## Graph Theory 2

### *Exercise Sheet 3*

due on November 9, 1pm

<http://bit.ly/2zqoEE9>

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**Exercise 1** (§1.41) [1 Punkt]

Prove that the cycles and the cuts in a graph together generate its entire edge space, or find a counterexample.

**Exercise 2** (§1.46) [1 Punkt]

Prove Gallai's theorem that the edge set of any graph  $G = (V, E)$  can be written as a disjoint union  $E = C \cup D$  with  $C \in \mathcal{C}(G)$  and  $D \in \mathcal{B}(G)$ .

**Exercise 3** (§3.11) [1 Punkt]

Show without using Theorem 3.2.6 that every edge of a 3-connected graph lies on some non-separating induced cycle.

**Exercise 4** (§4.26) [1 Punkt]

Find an explicit description of a cycle space basis among the face boundaries of a 2-connected plane graph.

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**Written Exercise** (§3.12)

Give an inductive proof of Theorem 3.2.6 based on Lemma 3.2.2. You may use the exercise §3.11 (number 3 on this sheet).