NDMI012: Combinatorics and Graph Theory 2
HW#1

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due Tuesday, March 9, 2021 before midnight (Prague time)

Remark: Please e-mail me (ipenev@iuuk.mff.cuni.cz) your HW as a **PDF attachment** (no other format will be accepted).

Problem 1 (40 points)**.** *Let $d \geq 3$ be an odd integer, and let G be a d-regular and $(d-1)$-edge-connected graph. Prove that G has a perfect matching.*

> ***Hint:*** *Imitate the proof Petersen's theorem.*

Problem 2 (20 points)**.** *Exhibit a 2-regular, 2-edge-connected graph that does **not** have perfect matching. Make sure you prove that your answer is correct.*

Problem 3 (40 points)**.** *Prove or disprove the following statement: "Every forest has at most one perfect matching."*

> ***Remark:*** *So, if the statement is true, then you should prove it. If it is false, then you should construct a counterexample.*