

6 TGR homeworks — November 7th, 2018

6.1 A *block* in a simple undirected graph G without loops is a maximal subset of vertices of G such that the induced subgraph is connected and without cut vertices. Fully characterize how blocks can look like.

Assume that we have two distinct blocks in G . What is the smallest and the biggest number of vertices that they have in common?

Justify your answers.

6.2 Given a number $n \geq 5$. Is it true that for every such n there exists a 2-connected simple undirected graph G without loops which satisfies:

- G has diameter $\text{diam}(G)$ equal to 2,
- and has $2n - 5$ edges?

If the answer is "yes", give an example of such a graph for every n ; if the answer is "no", justify.

6.3 Given a tournament G with odd number of vertices n , where $n \geq 3$.

Prove or disprove: *If G contains a Hamiltonian cycle then there exists a vertex v such that $G \setminus v$ also contains a Hamiltonian cycle.*