

Homework 1

Networks and Graphs

Deadline: April 13, 18:00

Please submit your answers using Canvas
Attach a single pdf file with your names, VUnet IDs and home-work group names and of course answers!

1 Matrices (25%)

Explain the effect on the adjacency and incidence matrices of a simple graph when:

- (a) deleting a vertex,
- (b) deleting an edge.

2 Degree sequences (25%)

Consider a graph with degree sequence $[2, 4, 2, 1, 3, 2]$.

- a) How many edges does the graph have?
- b) Draw two simple connected graphs with this degree sequence, which are **not** isomorphic.

3 Induction (25%)

For all integers $n > 4$, prove with induction that $n! > 2^n$ and explain every step. *Note:* The point is to use *induction* to show it. Another type of solution, even if correct, will not count. We also expect explanation for **every** step to make sure that you understand everything you write.

4 Proof (25%)

Prove that, in a simple connected graph, there cannot be an odd number of vertices with odd degree.

Note: Please don't just draw graphs. Write the proof as formally as you can.