Technische Hochschule Rosenheim

Computer Science Fundamentals WS 2021/22

Prof. Dr. J. Schmidt; D. Stecher, M.Sc. Exercise 13

Please solve the following exercises at home prior to the tutorial

Exercise 1

A person informs two others, who in turn inform two others each and so on. Draw a graph for four steps of this information spreading!

Exercise 2

What is the degree of the nodes of a complete graph with n nodes? How many edges does such a graph have?

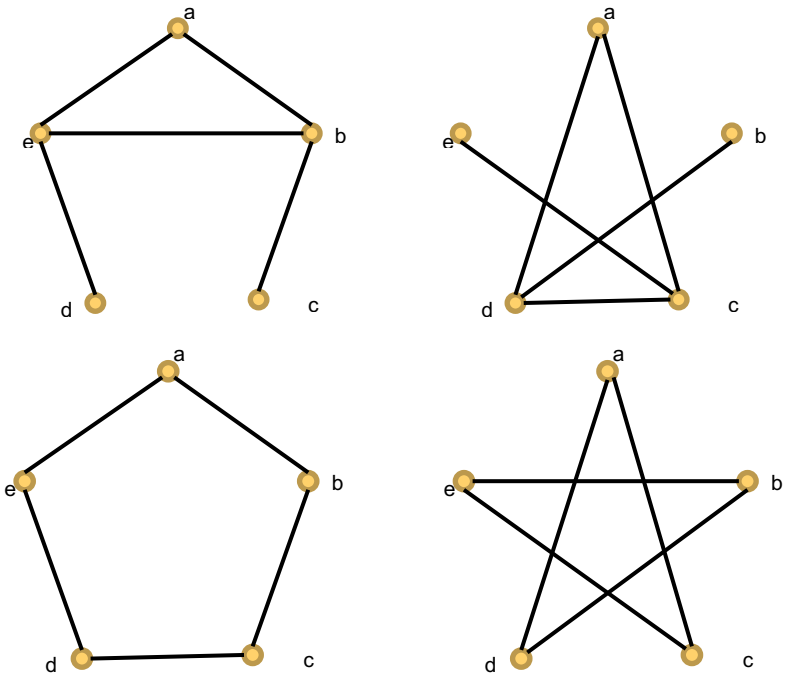
Exercise 3

Given is an undirected graph defined by a set of vertices V and a set of edges E:
V = {a, b, c, d, e, f, g}
E = { {a, b}, {b, c}, {a, c}, {a, e}, {f, g} }

a) Draw the graph.
b) How many connected components does this graph have? Name them. Are there separating vertices?
c) Give the degree of each vertex.
d) Does the graph contain cycles?

Exercise 4

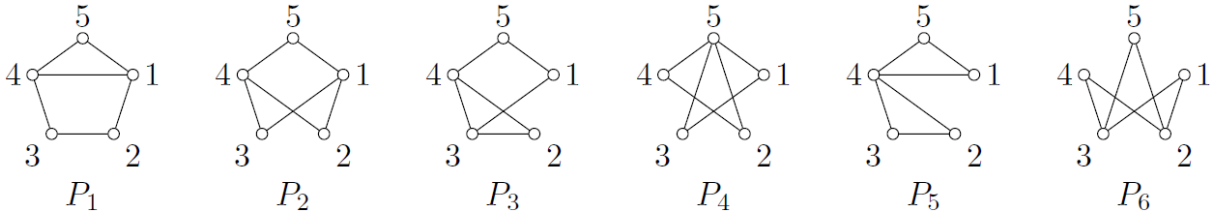
Which graphs are isomorphic? Why?



Exercise 5

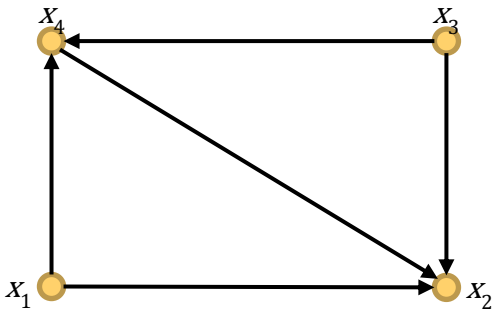
The sequence of degrees of a graph is given as an ascending-sorted n-tupel (n = number of vertices of the graph) containing the degree of every vertex.
Example: The sequence of degrees of the first graph (top left) from the preceding exercise is (1, 1, 2, 3, 3).

a) Determine the sequence of degrees for the following six graphs.
b) Give an isomorphism for every graph to one of the other five graphs.



Exercise 6

Given is the following directed graph:



a) Determine the adjacency matrix $\boldsymbol{A}$ and its powers $\boldsymbol{A}^r$ (r = 2, 3, 4).
b) What can you say about possible walks, cycles, and trails?