

Exercises - Home project 1

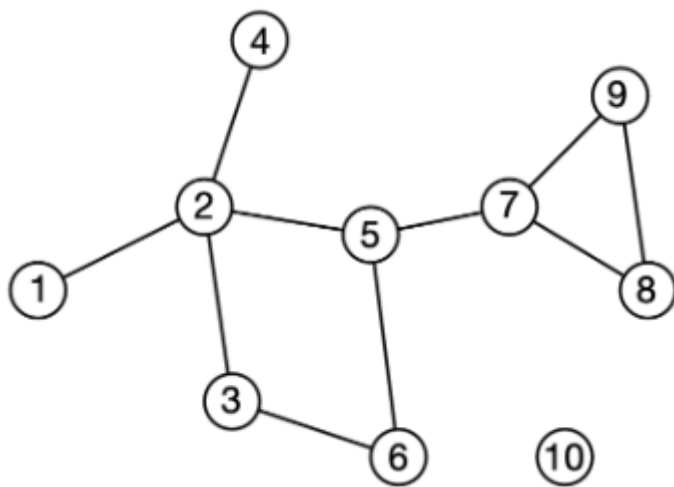
Include all your reasoning steps, but only the necessary ones.

Total points (10 + 5 Bonus)

PS: You can use code for 2.iii with python library such as networkx, but include the photo of your code, and the output.

(1) Imagine that your social graph/network has a subgraph/subnetwork where 14 of your friends including you are all friends with each other. What is such a subgraph/subnetwork called formally? How many edges are contained in this subnetwork? (2pts)

(2)



(i) Write down the adjacency matrix and the edgelist. (2pts)

(ii) We mentioned degree distribution on the last exercise. [17.5: Degree Distribution - Mathematics LibreTexts](#) . Draw the degree distribution of network above by hand. (2pt)

(iii) Find the number of $d=3$ paths between 2 and 3. Which node pair has the most $d=3$ paths? (2pts)
Hint: which graph representation is the best for this?

(3) Consider a bipartite network with N_1 and N_2 nodes in the two sets.

(i) What is the maximum number of edges the network can have? (1pt)

(ii) Find an expression for how many edges cannot occur compared with a non-bipartite network of size $N = N_1 + N_2$? (2pts)

(4) Make a python implementation of Havel-Hakimi algorithm, see [Exercises - Home project 1.ipynb](#) in home projects folder (4pts)