Exercise 6 – Exam Questions

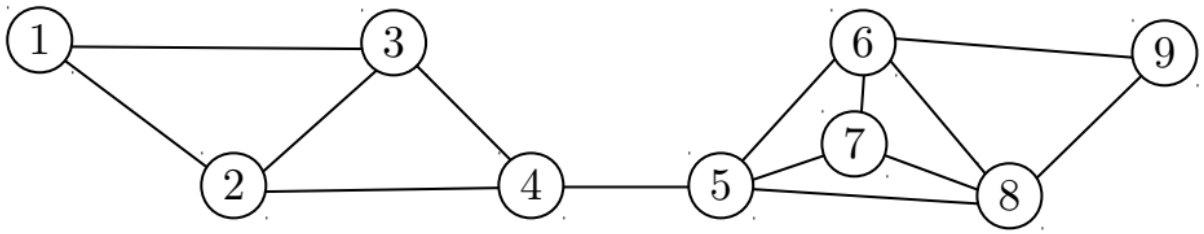
Members of the team:

Igor Fedotov
Stefan Vujovic

1 True or False (3 Points)

In a Dutch auction, prices go up.	0
In random graphs, the average clustering is normally higher than in social networks	0
A pure power law distribution $p(x) = c \cdot x^{-\alpha}, (\alpha > 1)$ shows as a straight line in a log-log plot	1

2 Graph Theory (7 Points)



Write down the adjacency matrix of the graph G.

0 1 1 0 0 0 0 0 0
1 0 1 1 0 0 0 0 0
1 1 0 1 0 0 0 0 0
0 1 1 0 1 0 0 0 0
0 0 0 1 0 1 1 1 0
0 0 0 0 1 0 1 1 1
0 0 0 0 1 1 0 1 0
0 0 0 0 1 1 1 0 1
0 0 0 0 0 1 0 1 0

$$C_i = \frac{2|\{e_{jk} : v_j, v_k \in N_i, e_{jk} \in E\}|}{k_i(k_i - 1)}.$$

Give the local clustering coefficient of node 1 and node 5.

For node 1:
k = 2, e = 1
Ci = 2*1/(2*(2-1)) = 2/2 = 1

For node 5:
k = 4, e = 3
Ci = 2*3/(4*(4-1))=6/12 = 1/2

Give the total number of wedges s in the graph.

wedges(u) = degree(u)*(degree(u)-1)/2

wedges(G) = $\sum_1^n$ wedges(Ui)

wedges(G) = 1+3+3+3+6+6+3+6 = 31

One variant of the global clustering coefficient is defined as the probability that two incident edges are completed by a third edge to form a triangle. Give it for

$$C = \frac{3 \times \text{number of triangles}}{\text{number of connected triplets of vertices}} = \frac{\text{number of closed triplets}}{\text{number of connected triplets of vertices}}.$$

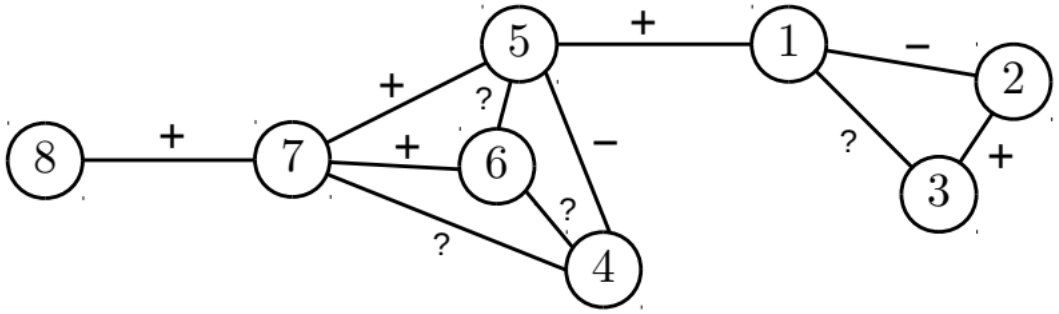
the
given graph.

NumOfTri = 7
Wedges = 31

C = 7*3/30 = 21/31 = 0.677

3 Signed Networks (Extra 3 Points)

A signed complete network is **weakly balanced**, if no three nodes have exactly two positive edges



between them (and one negative edge).

7-4	-
6-4	-
6-5	+
1-3	-