

341 Introduction to Bioinformatics:

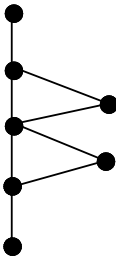
Biological Networks

Assessed Coursework 1

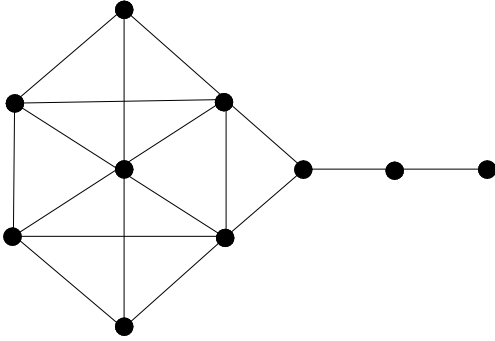
Due by the beginning of class, 4pm, on February 18, 2010

(Total 15 marks)

1. (2 marks) Take a graph with 8 vertices, 4 of them of degree two and 4 of degree one. Is this graph connected?
2. (1 mark) Different biological networks are modeled by different graphs. Which types of graphs are typically used to model the following networks: transcriptional regulation networks, protein-protein interaction networks, cell signaling networks?
3. (1 mark) Give examples of typical degree distributions in biological networks. How is the degree exponent defined and how can it be estimated from a given empirical network.
4. (2 marks) Find and label automorphism orbits of nodes in the graph below.



5. In the graph below compute:
 - a. (1 mark) average clustering coefficient,
 - b. (1 mark) average diameter,
 - c. (1 mark) degree distribution,
 - d. (4 marks) four centrality measures of each of its nodes.



6. (1 mark) Design an algorithm for computing the *diameter* of graph G . What is the running time of your algorithm? You can assume that breadth first search (BFS) is already implemented.
7. (1 mark) Design an algorithm for computing the *eccentricity centrality* of node v of graph G . What is the running time of your algorithm? You can assume that breadth first search (BFS) is already implemented.