CSI 35, Homework 8 on sections 10.2, 10.3

Due by Wed, Apr 2 or the following class.

Please use lots of space and explain your answers, showing clearly any work you had to do. Each question is worth 5 points.

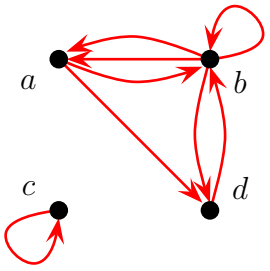
Section 10.2 Graph terminology

(1) **(a)** Draw a graph with 6 vertices so that the vertices have degrees 2, 2, 5, 5, 5, 5 respectively.

(b) What does the Handshaking Theorem say about this graph?

(c) Check that the Theorem is true for the graph you drew. (It must be true so if not you made a mistake somewhere!)

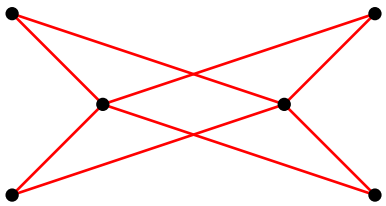
(2) For this directed graph with vertices a, b, c, d find **(a)** the number of edges, **(b)** the in-degree of each vertex, **(c)** the total in-degree, **(d)** the out-degree of each vertex and **(e)** the total out-degree.



(3) Draw each of these graphs:

(a) K_7 **(b)** $K_{1,7}$ **(c)** $K_{3,4}$ **(d)** C_7 **(e)** W_7

(4) Is this graph bipartite? (Equivalently, can its vertices be colored with just two colors?)

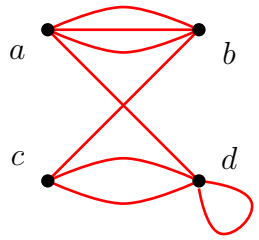


(5) For which values of n are these graphs bipartite?

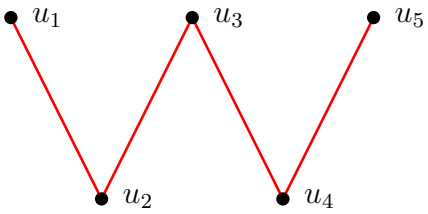
(a) C_n **(b)** W_n **(c)** K_n **(d)** $K_{2,n}$

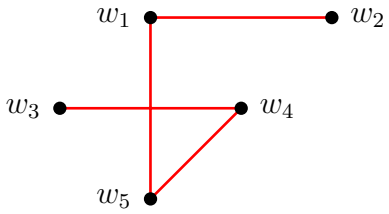
Section 10.3 Representing graphs, isomorphism

(6) Write down the adjacency matrix for this pseudograph:

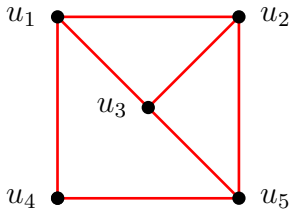


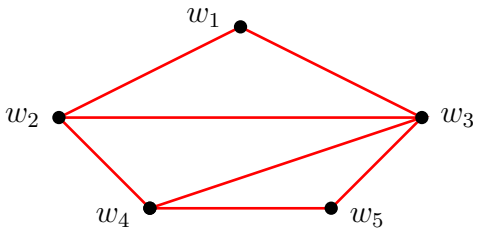
(7) Are these two graphs isomorphic? If you think they are, prove it by using a function f to match their vertices and then show that the corresponding adjacency matrices are the same.



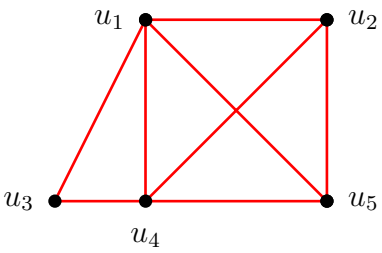


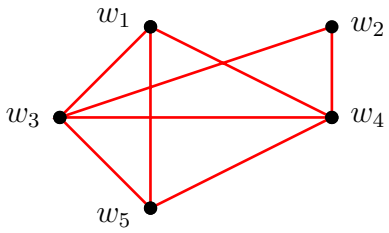
(8) Are these two graphs isomorphic? Some ways to prove graphs are not isomorphic are to show they have different numbers of vertices, edges, different degrees or different kinds of cycles.





(9) Prove that these two graphs are isomorphic, or that they are not:





If you get stuck on a question or aren't sure if you understand it:

- Go over the relevant class notes or section in the textbook.
- Ask me about it after class.
- Come to my office hours: Mon 2:00 - 3:00, Wed 2:00 - 3:00 in CP 317.
- Go to the Math Tutorial Lab in-person in CP 303 or online.