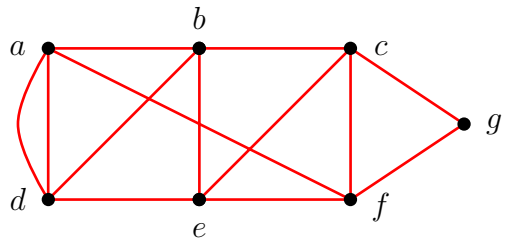
CSI 35, Homework 10 on sections 10.5, 10.6, 10.8

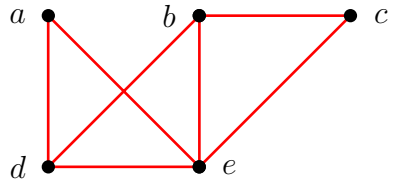
Due by Mon, Apr 21.

Section 10.5 Euler and Hamilton paths

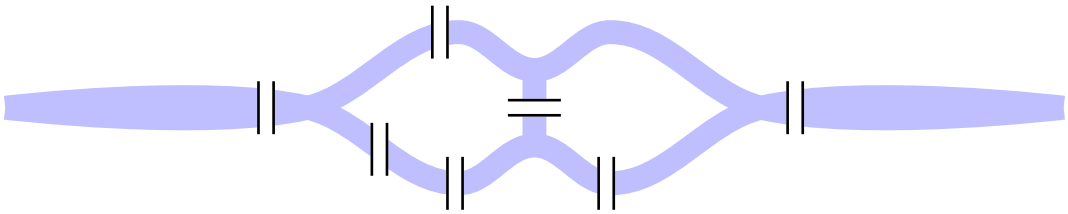
(1) List the vertices giving an Euler circuit for this graph.



(2) Show that this graph has an Euler path by listing the vertices of this path. Does it have an Euler circuit? Explain.



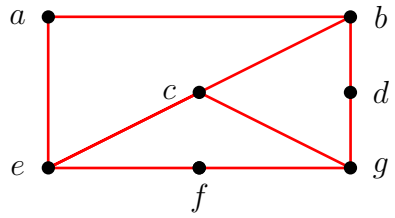
(3) Can you cross every bridge exactly once and get back to where you started? Explain.



(4) Which of these graphs have Euler circuits? Explain why or why not in each case.

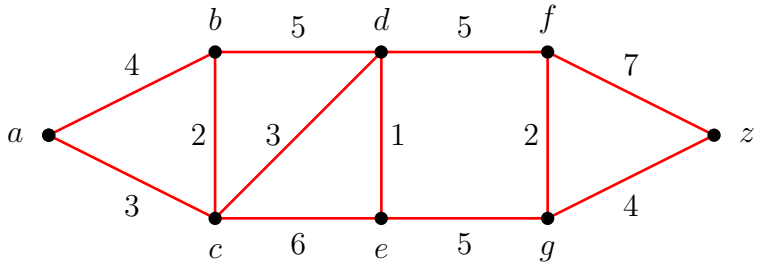
(a) C_{100} **(b)** W_9 **(c)** K_{99} **(d)** $K_{2,4}$

(5) Does this graph have a Hamilton circuit? Explain.

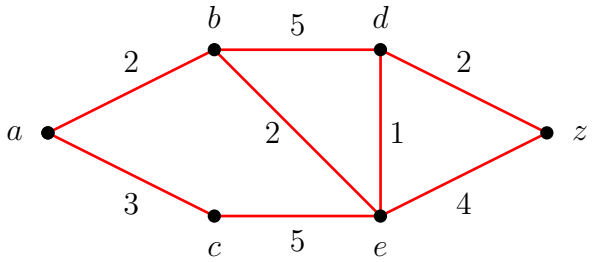


Section 10.6 Shortest paths

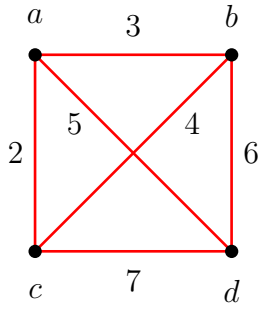
(6) Find the shortest path from a to z in this weighted graph by just playing around with the possibilities. Give the shortest path you find as a sequence of vertices, and give its length.



(7) Find the shortest path from a to z in this weighted graph using Dijkstra's algorithm. Show the steps of the algorithm by making a table, as in the notes, that gives the set S and the values of the labels L at each iteration. Give the shortest path you find as a sequence of vertices, and give its length.

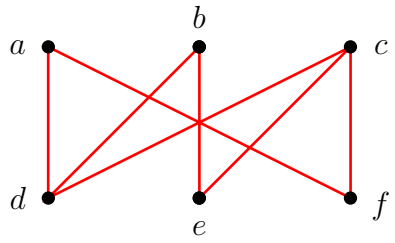


(8) Solve the traveling salesperson problem for this graph. Do this by trying the different possibilities and finding the Hamilton circuit with minimum total weight.

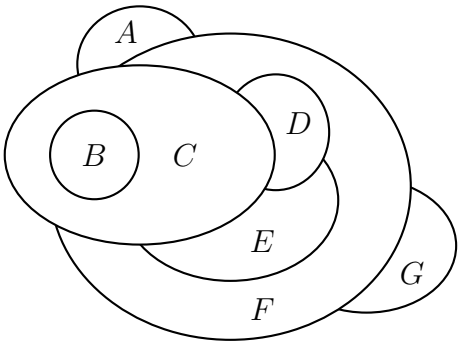


Section 10.8 Graph coloring

(9) Is this graph planar? If it is, redraw it so that no edges cross.

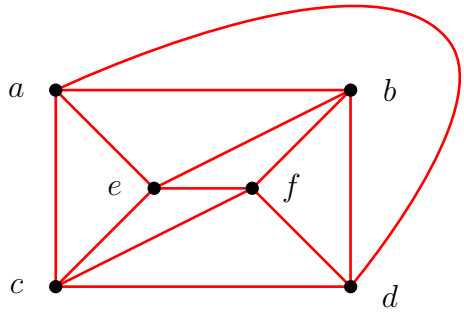


(10) Make the dual graph for this map. Then find the smallest number of colors needed to color the map so that adjacent regions have different colors.



(Hint: to make the dual graph for this map, draw a vertex for each region. Then two vertices have an edge between them if their regions share a border. The dual graph makes the connections clearer and coloring easier.)

(11) Find the chromatic number of this graph:



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.