

Graph Theory and Combinatorics MATH-42021/52021.
 Home Work 1, due on Saturday July 21
 Instructor: Prof. Artem Zvavitch
 13 points (yes, 3 extra points!)

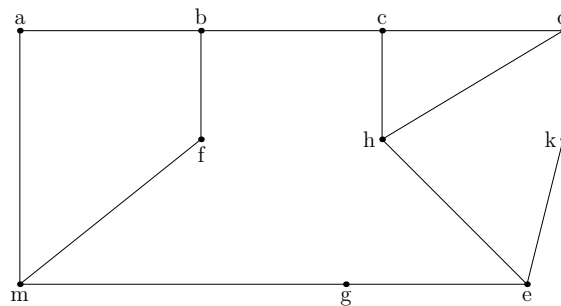


FIGURE 1

Problem 1. Consider the graph G in Figure 1,

- Show a path from vertex a to vertex k .
- Give an example of circuit which would contains both a and k . Also how many circuits which contains both a and k are there? (**note two circuits C and C' are different, if there is a vertex v in one of them, say in C , such that $v \notin C'$, for example, (c, h, d, c) is the same circuit as (h, d, c, h) . The same is true about undirected paths**)
- Two vertices are connected if there is a path between them. The graph is connected if any two vertices are connected. Can you remove one edge from graph G in such a way that it will disconnects G ? (explain!)
- Find all sets of 2 edges whose removal disconnects the graph.
- What is the minimal number of vertex deletion required to disconnect G ? (explain!)
- Find the minimal edge cover of G .
- Find a maximal independent set of G .
- Please, draw subgraphs of vertices of degree 2 i.e. the subgraph of all vertices in G which have degree 2 in G .
- Please, also draw subgraph of vertices of degree 3 i.e. the subgraph of all vertices in G which have degree 3 in G .

Problem 2. List all **nonisomorphic** graphs with four vertices.

Problem 3. Give an example of two non-isomorphic, connected graph with 6 vertices and 9 edges each.

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Problem 4. Which pairs of graphs among those four are isomorphic?

