Homework 1

Date	@August 31, 2023
Type	Homework

Question 1

1a: K_5

Complete
Simple
Connected
Cyclic
Unweighted
Undirected

1b

Tree (unrooted)
Simple
Connected
Acyclic
Unweighted
Undirected
Planar

1c

Not Connected
Cyclic
Weighted
Undirected
Planar

1d

Connected
Tree (unrooted)
Acyclic
Weighted
Directed
Planar
DAG

Question 2:

$$\begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

`adj[1][4]` is 1, as there exists an edge from 1 to 4. I did not put 2, as that might indicate a weighted graph.

Question 3:

A trail cannot repeat edges, but a walk can.
The walk b, c, b, c, d repeats the edge (c, d), so it is not a trail.

Question 4:

A path cannot repeat nodes, but a trail can. A trail cannot repeat edges, but a path can. The trail b, e, f, e, d repeats the vertex e, but uses different edges. This makes it a trail but not a path.

Question 5:

A path from b to d is b, c, d. This path does not repeat nodes.

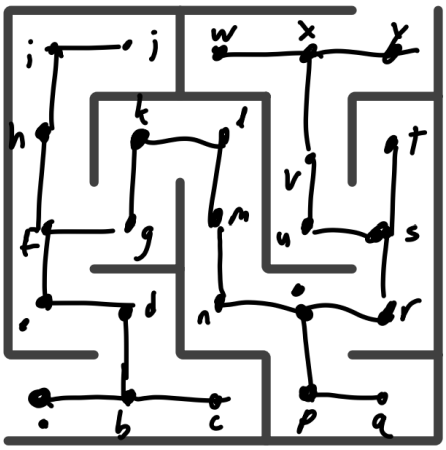
Question 6:

A path cannot repeat nodes, but a trail can. A trail cannot repeat edges, but a path can. The trail b, e, f, e, d repeats the vertex e, but uses different edges. This makes it a trail

but not a path.

Question 7

Here is an image of the maze with the associated graph drawn on top of it.



Question 8:

Depth-first search is implemented in `homework1.py`. I solved the maze with the path:
(0,0), (1,0), (1,1), (0,1), (0,2), (1,2), (1,3), (2,3), (2,2), (2,1), (3,1), (4,1), (4,2), (3,2), (3,3), (3,4), (4,4)

Question 9:

Breadth-first search is implemented in `homeework1.py`. I found the shortest path to checkmate to be:
g2g4, e7e6, f2f3, d8h4