Optional Homework Due April 30

Show your work. Answer without work receives no credit.

Graphs

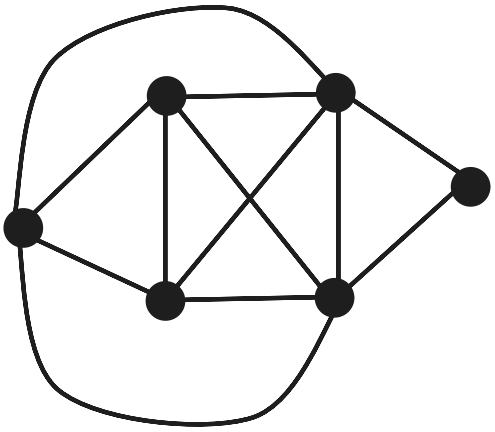
Problem 1

Draw a (finite, simple) graph G with the following properties, or explain why this task is impossible.
(A) G has four vertices, each having degree 3.
(B) G has 13 vertices, of which 5 vertices are of degree 3 and 8 vertices are of degree 4.
(C) G has vertex set $\{a, b, c, d\}$ with $\deg(a) = \deg(d) = 3$ and $\deg(b) = \deg(c) = 2$:
(D) G has vertex set $\{a, b, c, d\}$ with $\deg(a) = 1$, $\deg(b) = 2$, $\deg(c) = 3$, $\deg(d) = 4$.

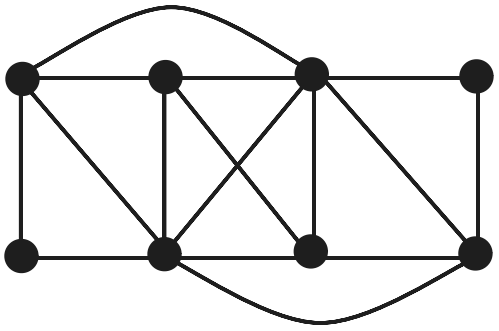
Euler walks

Problem 2

State whether an Euler walk exists for the graph below. If it exists, label the edges of the Euler walk with increasing numbers from starting vertex to the ending vertex



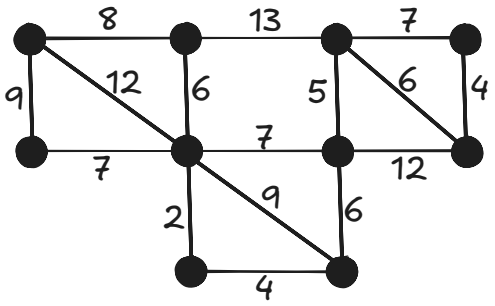
Problem 3



Minimum spanning trees

Problem 4

Houses are to be connected by utility lines. Due to the rocky soil, the costs of extending utility lines varies from house to house. The graph below depicts the houses as vertices, proposed excavation routes as edges, and the cost of extending utility lines through a given edge as an edge weight. Determine the best way to connect the houses onto one utility network.



Problem 5

The table below shows the distances between Atlanta, Columbus, Kansas City, Minneapolis, Pierre, and Tulsa. Use Kruskal's algorithm to find the MST connecting the six cities.

	Atlanta	**Columbus**	**KC**	**Minneapolis**	**Pierre**	**Tulsa**
Atlanta		533	798	1068	1361	772
Columbus	533		656	713	1071	802
KC	798	656		447	592	248
Minneapolis	1068	713	447		394	695
Pierre	1361	1071	592	394		760
Tulsa	772	802	248	695	760	