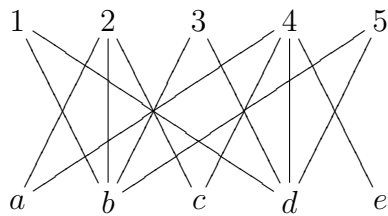


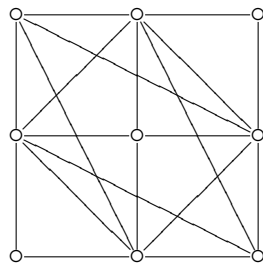
1. (This problem is worth 3 points each part, 12 points total.)

(a) The graph $K_{2,20}$ is planar. Find the number of regions.

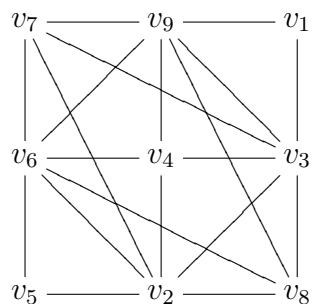
(b) Prove there is no perfect matching using Hall's theorem.



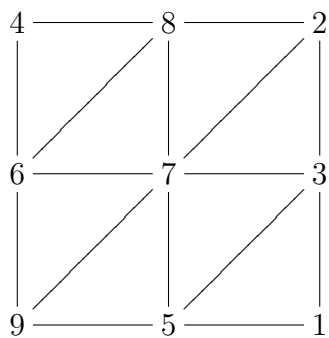
(c) Compute the chromatic number $\chi(G)$.



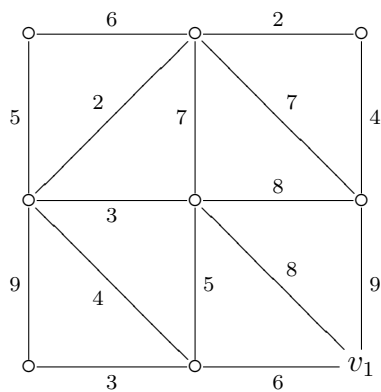
(d) Color the graph using Sequential Coloring algorithm.



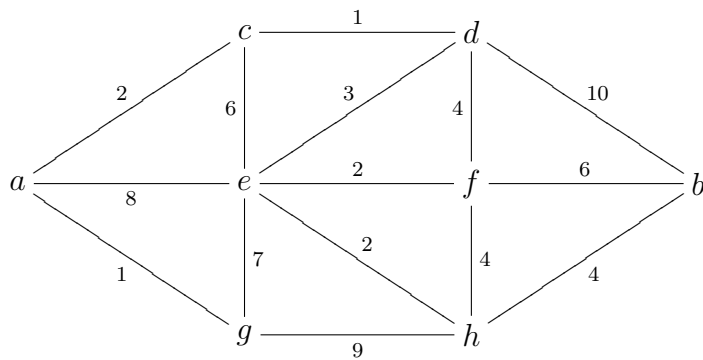
2. (4 points) Draw the rooted spanning tree using Breadth-First Search starting at vertex number 1.



3. (4 points) Draw the minimal spanning tree using Prim's algorithm starting at v_1 .

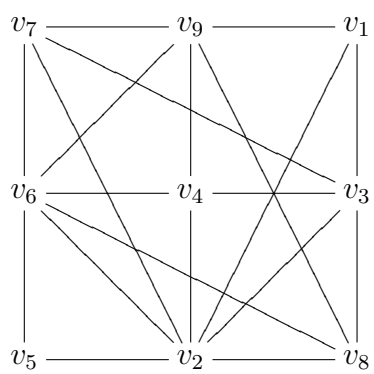


4. (4 points) Use Dijkstra's algorithm to compute $d(a, b)$.

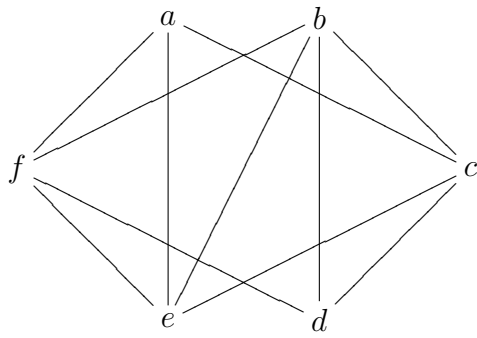


5. (4 points) Prove that $\overline{P_{10}}$ is not planar using Euler's test.

6. (6 points) Color the graph using Welsh-Powell algorithm.



7. (6 points) Determine planar or not planar using Hamilton cycle.



-Amin Witno