Math 3 - Discrete math (V3020) Exercises, week 5 (due Oct 7th, 2025)

1. Let G be a graph with n vertices and m edges, and let v be a vertex of G of degree k and e an edge of G. How many vertices and edges are in
   (a) $G - e$?
   (b) $G - v$?
   (c) $G \backslash e$?
2. Draw the following graphs
   (a) the null graph N_5,
   (b) the complete graph K_6,
   (c) the complete bipartite graph $K_{2,4}$,
   (d) the complement of the cycle graph C_4.
3. Write the adjacency and the incidence matrix of the graph in Fig. 1
4. Are the following statements true or false? Why?
   (a) Any two isomorphic graphs have the same degree sequence.
   (b) Any two graphs with the same degree sequence are isomorphic.
5. A simple graph that is isomorphic to its complement is called self-complementary. Prove the following statement. If G is self-complementary, then G has $4k$ or $4k + 1$ vertices, $k \in \mathbb{N}$.

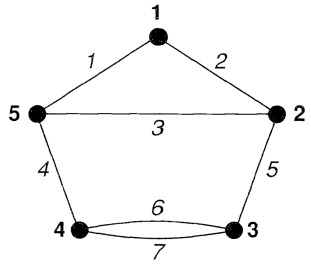

Figure 1: The graph for problem 3.