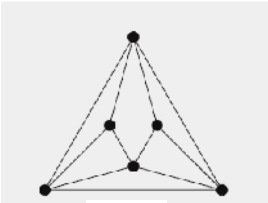
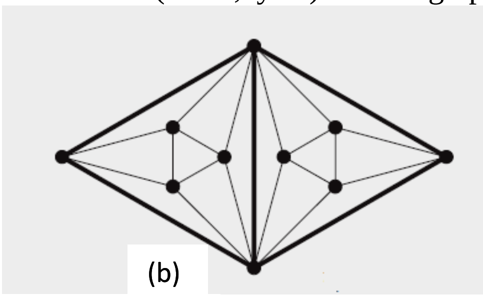
Faculty of Mathematics and informatics
Mathematics department
Level: L3(Applied Mathematics)
A/Y: 2025/2026

TD Series N°2

Exercise1:

- Determine the type of each graph
- Show if it exists an Eulerian (chain, cycle) in each graph
- Show if it exist a Hamiltonian(chain,cycle) in each graph


(a)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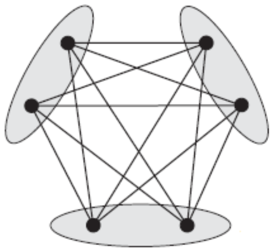
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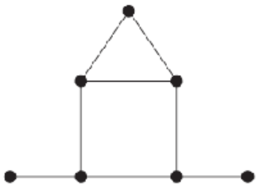
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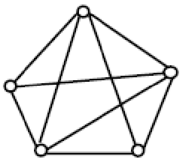
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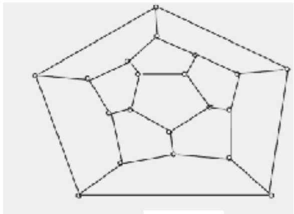
(f)

Exercise2

The city of Königsberg in Prussia (now Kaliningrad) consisted of four districts, separated by the branches of the Pregel River. The inhabitants of Königsberg wondered whether it was possible, starting from any district of the city, to cross all the bridges without crossing any bridge more than once and to return to the starting point.?
Solve the problem using graph theory.

Exercise3

Let V= $\{1,2,3,\ldots,n\}$. Let $R = \{(i,j), i,j \in V, and\ at\ least\ one\ is\ prime\ \}$.
Modelize this problem using graph The resulting graph G=(V, E) is denoted by Gn. Draw $G4$ and $G5$. (determine the type of graphs)

Exercise4

- proof that every cubic graph has an even number of vertices.
- We consider the (p,q) graph , Proof that $\delta \leq \frac{2q}{p} \leq \Delta$

Exercise5

Let f be an isomorphism of the groups (graphs) G1 = (V1, E1) and G2 = (V2, E2).
Let $v \in$ V1. Show that $d_{G1}(v) = d_{G2}(f(v))$.

Exercise6

Let the following two graphs $G1(V1, E1), G2(V2, E2)$

- Show the different types of G1 and G2
- Study the connectivity
- Study the strong connectivity
- Extract the connected components from the graph G1 and G2
- Extract the strongly connected components from G1 and G2.