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SOME PROBLEMS OF TOPOLOGY

Topology is a relatively young and the most abstract branch of modern mathematics that studies the ideas of continuity. In the XXI century, the century of rapid development of science and technology, the introduction of new technologies into all spheres of public life, has become increasingly popular with people that have a tendency to unconventional thinking, able to set new, logical and complex tasks and solve them.

Elementary ideas of topology arise directly when observing the world around you. The first important observations and accurate topological correlations were found by L. Euler, K.-F. Gauss and B. Riman.

Topology is a branch of mathematics which studies properties of figures (or spaces), preserved by continuous deformations such as stretching, compression or bending. The main objects studied by topology are topological spaces. The main task of topology is to study topological properties of spaces, or topological invariants [1].

There are many various topological problems of different levels of complexity, solving them we use the basic concepts of topology, homeomorphisms and graphs, their properties and types.

One of the most interesting problems is that of the seven bridges of Königsberg. The city of Königsberg was located on the banks of the river Pregel. It was necessary to find a route through the city so that each bridge could be passed only once and one could not get on the island except over the bridge.

Solving it, Euler replaced each of the land areas by an abstract "vertex", and each bridge by an abstract "edge", which only served to reflect the combination of pairs of vertices (land masses) by the bridge. The mathematical structure received was called a graph (Fig.1).

Euler showed that the possibility to pass through the graph, passing each edge only once, depends on the degrees of vertices. The degree of a vertex is the number of edges that are tangent to it. Euler showed that a necessary condition for the walk of the desired species through the graph is the graph connectivity and the absence or presence of exactly two vertices of an odd degree. Further, if there are two vertices of an odd degree, the Euler way will begin in with one of the vertices and end in another. For the four vertices of an odd degree, the historical problem has no solution [2].

The solution of the seven bridges of Königsberg problem marked the beginning of the development of graph theory and topology as a science.



Fig.1 Königsberg bridges and graph

The above mentioned solution to this problem is a large scientific event not only because it solved a very difficult math riddle, but also because it contributed to all fields of science and everyday life. The obtained solutions of the known tasks are widely used in physics, chemistry, biology, economy, informatics, medicine, etc. Topological tasks play significant role in the formation of logical deductive reasoning.

LITERATURE

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