The Arbelos in Three-Dimensional Space and the Archimedean Spheres

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Arbelos is a plane region bounded by three semicircles with three apexes such that each corner of each semicircle is shared with one of the others, all on the same side of a straight line that contains their diameters. In this project, Arbelos redefined in 3D, and the notion of 3D-Arbelos has been introduced. Same path has been followed as in the Arbelos, except that the spheres were used instead of the circles. As a result, it was determined that the Archimedes circles turned into an infinite number of identical Archimedean spheres in 3D and the locus of the centers of them was different circles. We focused on the Archimedean spheres based on twin Archimedean circles and the Bankoff circle - also known as the third Archimedean circle. It is common to explore new Archimedean circles and search for generalizations in the literature. This project focuses more on new findings caused by the new dimension and analyzes which properties in 2D will still be held in 3D. Unlike the literature, new features are sought with the help of the concepts of volume and surface area that appear in 3D. Our results could be used in the electromagnetic fields in antenna theory, astrophysics and bioelectromagnetics. Moreover, arranging the interior design of a parachute or a hot air balloon as a 3D-Arbelos allowing radical plane to shift, airflow can be effectively used for directing it. 3D-Arbelos should be a part of the curriculum to improve creativity and problem-solving skills of the students.

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