

Topological Methods in Real Algebraic Geometry

Syllabus

Course description This will be a broad introduction of INTERMEDIATE level to ALGEBRAIC GEOMETRY over the field of real numbers.

It is not incorrect to call this topology, because technically this is rather topology, than algebraic geometry. Real algebraic varieties are considered together with their complexifications, which are ambient complex algebraic varieties. In this environment, a real variety appears as the fixed point set of an antiholomorphic involution. Therefore, the first layer of results belongs to the topology of involutions on manifolds, but the topology will be developed only as long as it helps to study algebraic varieties. They will be the main focus of the course.

It's a good time to enter to the real algebraic geometry - new directions have recently emerged (high dimensions and real algebraic knots).

The following topics are planned to be covered: topology of abstract curves, plane projective curves and restrictions on their topology, topological classification of nonsingular plane curves of low degrees, rigid isotopies, extra structures which come from the complexification, deformations of singularities, Vassiliev-Arnold invariants of plane rational curves, real toric surfaces, patchworking, tropical geometry and its real version, topological classification of non-singular surfaces of degree < 5 , real K3 surfaces, real algebraic knots and their invariants. This list of topics is subject to change, depending on the interests of the audience.

This course may be interesting to students studying algebraic geometry and/or topology.

Prerequisites: basic algebraic topology (homology theory and duality). No background in algebraic geometry is required, but certainly may be useful.

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Meetings: Mon Wed 10:00am - 11:20pm in Phy129.

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