

# **Topological Invariants of Plane Curves and Caustics (University Lecture Series)**

V. I. Arnold



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## **Topological Invariants of Plane Curves and Caustics** (University Lecture Series)

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**Topological Invariants of Plane Curves and Caustics (University Lecture Series)** V. I. Arnold This book describes recent progress in the topological study of plane curves. The theory of plane curves is much richer than knot theory, which may be considered the commutative version of the theory of plane curves. This study is based on singularity theory: the infinite-dimensional space of curves is subdivided by the discriminant hypersurfaces into parts consisting of generic curves of the same type. The invariants distinguishing the types are defined by their jumps at the crossings of these hypersurfaces. Arnold describes applications to the geometry of caustics and of wavefronts in symplectic and contact geometry. These applications extend the classical four-vertex theorem of elementary plane geometry to estimates on the minimal number of cusps necessary for the reversion of a wavefront and to generalizations of the last geometrical theorem of Jacobi on conjugated points on convex surfaces. These estimates open a new chapter in symplectic and contact topology: the theory of Lagrangian and Legendrian collapses, providing an unusual and far-reaching higher-dimensional extension of Sturm theory of the oscillations of linear combinations of eigenfunctions.

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