

# Geometry of Curves and Surfaces with Symbolic Computations

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## Abstract

These Lectures are devoted to geometric modeling of curves and surfaces using symbolic computations and visualizations with Maple program.

### Lecture 1: Functions and Graphs

- Numbers and functions.
- Curvilinear coordinates.
- Interpolation and smoothing.

### Lecture 2: Curves

- Plane and space curves.
- Differential geometry of curves.
- Variational problems.

### Lecture 3: Transformations and projections

- Rigid motions and polytopes.
- Affine motions and projections.
- Projective transformations.

### Lecture 4: Surfaces

- Differential geometry of surfaces.
- Classes of surfaces.
- Singular surfaces.

## Lecture 5: Non-Euclidean Geometry

- Möbius transformations.
- Hyperbolic motions.
- Hyperbolic geometry.

## References

- [1] Rovenski V., *Geometry of Curves and Surfaces with MAPLE*, Birkhäuser, Boston 2000.
- [2] Rovenski V., *Modeling of Curves and Surfaces with MATLAB*, Springer, Berlin 2010.
- [3] Toponogov V., *Differential Geometry of Curves and Surfaces: A Concise Guide*, Birkhäuser, Boston 2005.