

Questions “Applied Geometry, Part I”

This list of question is to be changed every once in a while. Please download the most recent list!

- Central projection, parallel projection and normal projection in comparison (ratio preservation, parallel preservation).
- Counting problems: How many points/straight lines/planes are there in the plane or in three-dimensional space? What consequence follows from the fact, that three-dimensional space contains infinitely as many straight lines as points or planes?
- Principle of duality & two examples.
- Platonic solids: What characteristic properties do they have? Name all five.
- What is an Archimedian solid?
- How do you display a circle in normal projection?
- Definition of the tangential plane & the surface normal.
- What are elliptical, hyperbolic and parabolic surface points? Which points are on a developable surface?
- What is a contour point, and when does it lie on the self-shadow boundary?
- Definition of arbitrary cylindrical surfaces and conic surfaces.
- How can one find the Northern Star?
- Which surface generate the sun rays through a point during the course of a day? How can the opening angle of this cone of revolution be constructed?
- What is the definition of developability? Which known surfaces are developable, and which are not? Is there an optical criterion by which their developability may be judged?
- What is the oblique section of a cone of revolution turn and what is its development?
- What are the conditions that the intersection curve of twocylinders consists of two ellipses?
- Second-order surfaces of revolution, and especially the single-shell hyperboloid of revolution.
- Torus: Definition, contour.
- Definition of ruled surfaces. Examples (cylinder, cone, tangential surface of spatial curves, HP-surface, single-shell hyperboloid, conoid, helical surface).
- What are the two ruled surfaces with two pencils of generatrices (HP-surface, single-shell hyperboloid - always two types of generation).
- Which surfaces of revolution are simultaneously ruled surfaces?

- Why are ruled surfaces not developable in general? Which are these in particular?
- Conoids: Definition, two examples (HP-surface, circular conoid).
- Definition of helical motion and spiral motion. Parameters, path curves in top view and in front view.
- Examples for helical surfaces and spiral surfaces (helical surfaces, snail shells, etc.)
- What is a helispiral? Examples from nature (horns of animals, spiral nebulae/galaxies).