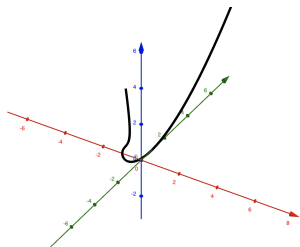
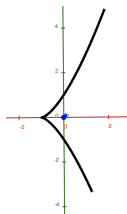


Algebraic Geometry

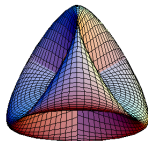
Algebraic Geometry studies zero loci of polynomials, as the following space curve



and its projection to the x, y plane.



These loci are often considered into projective spaces. The below picture is the Roman surface representing a model of the real projective plane.



The left hand side cuspidal cubic has equation $y^2 - (x + 1)^3 = 0$ and its homogeneous equation is

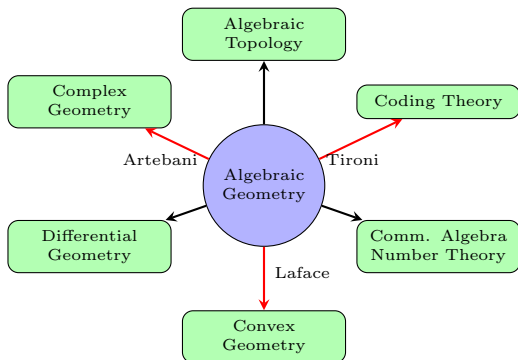
$$y^2 z - (x + z)^3 = 0.$$

It lives in the projective plane, which includes the “point at infinity” of coordinates $[0, 1, 0]$.

Algebraic Geometry

At the Mathematical Department of the UdeC

Apart from Algebraic Geometry, we interact with other areas of mathematics, both at the teaching level (black arrows) and at the research level (red arrows).

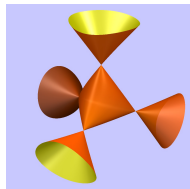


Algebraic Geometry

Software

An example of calculations done with the computer algebra program [Magma](#), used by all the members of the Algebraic Geometry group.

```
> P<x,y,z,w> := ProjectiveSpace(Rationals(),3);
> S := Scheme(P,Numerator(1/x+1/y+1/z+1/w));
> SingularPoints(S);
{@ (0 : 0 : 0 : 1), (0 : 0 : 1 : 0),
(0 : 1 : 0 : 0), (1 : 0 : 0 : 0) @}
> [#Points(ChangeRing(S,GF(2^n))) : n in [1..5]];
[ 11, 29, 89, 305, 1121 ]
```



These programs: [Magma](#), [Macaulay 2](#), [Singular](#), etc. can help in doing mathematical experiments which are useful to guide one in research.

Algebraic Geometry

References

Online textbooks.

- ▶ [Algebraic Geometry](#), by A. Gathmann.
- ▶ [Foundations of Algebraic Geometry](#), by R. Vakil.
- ▶ [The Stacks project](#).

Textbooks

- ▶ [Algebraic Geometry](#), by R. Hartshorne.
- ▶ [Cox rings](#), by I. Arzhantsev, U. Derenthal, J. Hausen, A. Laface.

Videos

- ▶ [Algebraic Geometry](#), by H. Bedi.
- ▶ [Toric varieties](#), by J. Hausen.

Charlas

- ▶ [About Mirror Symmetry in Algebraic Geometry](#), by M. Artebani.
- ▶ [Polarized Surfaces with Relatively Small Second Class](#), by A. L. Tironi.
- ▶ [Álgebras Graduadas](#), by A. Laface.