

# MATH 431 Introduction to Algebraic Geometry

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by

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The aim of this course is to show you that all the basic tools you acquired during your undergraduate years can be put together in one of the most spectacular branches of mathematical research. You will not need to develop new machinery to start this course. You already know all the necessary tools to begin.

If you are not going to continue with mathematics after you graduate, this is a good opportunity for you to see how everything you learned so far is utilized in doing serious work in a concrete and coherent manner. This is a chance to see how everything you learned so far in different courses tie together.

On the other hand, if you are thinking of continuing mathematics after graduation, this course will give you the taste of actual research which uses techniques from all parts of mathematics and puts them together to uncover hidden gems of geometry.

Algebraic Geometry is the study of *geometric objects*, but what is a typical *geometric object* and how many of them are there?

As familiar geometric objects we can think of the real line and the real parabola. They look different but we can bend the line to make it look like a parabola. It requires a little more imagination to see how a parabola and a hyperbola can be considered the same. How about a cubic curve? Can we bend it in some smart manner so that it looks like a parabola? Are all curves the same, after some ingenious bending and matching? So, how many different curves can we have?

We start with this innocent question and let the spirit of geometry carry us over to new terrain. Not surprisingly, we will start with calculus techniques. We will not be shy to admit that we know how to handle imaginary numbers if needed. We will also not resist to recognize a ring when we see one.

It is like already having all the ingredients of a good meal. All that is left for us is to put them together in careful portions and cook.

That is what this course is all about.