Fall 2023 Course Advertisement:

Math 595, Sec. 3 - Algebraic Geometry

Instructor: Dr. Jason McCullough
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Time: MWF 3:20-4:10pm

Description: Algebraic Geometry is the study of solutions to systems of polynomial equations. Its roots are classical with many advances made by the Italian school. Grothendieck revolutionized algebraic geometry in the 1960s with the introduction of schemes. This will be a broad but approachable introduction to algebraic geometry, with an emphasis on classical results like:

- A smooth cubic surface contains exactly 27 lines (see picture above)
- Projective plane curves (with no common components) of degrees d and e intersect in precisely de points (counting multiplicity). (Bezout’s Theorem)
- Classification of varieties of minimal degree

Textbook: Some combination of the following: Algebraic Geometry by Gathmann, An Invitation to Algebraic Geometry by Smith et. al., Algebraic Geometry by Harris, Basic Algebraic Geometry 1 by Shafarevich

Suggested Prerequisite: Math 505 (although you may be able to get by with less. If in doubt, please see me.)

Course topics: Algebraic varieties (affine and projective), morphisms, Zariski topology, Segre/Veronese/Grassmannian varieties, smooth varieties, blow ups, birational maps, dimension, 27 lines on a cubic, Sheaf cohomology. If times allows: Riemann-Roch theorem, schemes, intersection theory.

Assessments: There will be approximately 5 homework sets throughout the semester.