FOR HONORS MATH STUDENTS: READING GROUPS

Would you like to learn something fun and interesting? Build on your good foundation for graduate school? Consider signing up for one of the courses below. Just email the teacher of the course you would like to take to get time and meeting information. Honors math majors preferred, but courses open to anyone.

Projective Geometry

- Taught by Edward Burkard, <eburkard@nd.edu>
- **Abstract:**

  If you have taken a course on Topology, surely you have run into the space $\mathbb{R}P^2$, known as the "real projective plane" which is the space of all lines through the origin of $\mathbb{R}^2$ (or perhaps you have even seen $\mathbb{R}P^n$). This is a construction that can be done on an abstract vector space (that is a vector space over an arbitrary field K). This construction and its properties arise not infrequently in topology. My topological bias aside, this material will surely help you if you ever plan to take a course in, or study, Algebraic Geometry. In this reading group we will go through the construction of projective space and look at some of its properties, Desargues' Theorem and its relevance to projective geometry, we will put coordinates on projective space, we will study the space $PG(r, F)$ (the r-dimensional projective space of the field F), and look at Non-Desarguesian planes. If time permits we can also look at conics over various fields and quadrics in $PR(3, F)$.

- Text:

  Projective Geometry: An Introduction by Rey Casse. This book is about $30 online, but the library has an online copy which should be accessible to you for free.

Algebraic Curves

- Taught by Jeffrey Madsen, <jmadsen@nd.edu>
- **Abstract:**

  Algebraic geometry is the study of spaces which are defined by polynomial equations. These spaces, called varieties, can be understood algebraically via an associated ring called the coordinate ring, allowing problems to be approached from either a geometric or an algebraic angle. This course will be an introduction to algebraic geometry through the study of algebraic plane curves. Topics will include affine varieties, the projective plane, singularities, and intersection multiplicity, leading to Bezout's theorem, a remarkable fact which allows us to count the intersections of two plane curves. Some basic knowledge of rings and fields from an abstract algebra course is recommended as a prerequisite.

- Text: *Algebraic Curves* by William Fulton, available for free online at http://www.math.lsa.umich.edu/~wfulton/CurveBook.pdf.