Math 503   Galois Theory   Spring 2022

Instructor   Amites Sarkar

Text   Galois Theory (4th edition)
Ian Stewart

Course content

At the heart of Galois theory is a beautiful and surprising connection between field theory and group theory. This connection, the **Galois correspondence**, is the key to the solution of some famous problems in algebra and geometry, such as the construction of regular polygons and the solution of equations by radicals. Galois himself had a particularly short and tragic life, which ended in a mysterious pistol duel. The version of his theory that we shall study dates from around 100 years after his death.

After a short review of the fundamental theorem of algebra and factorization of polynomials (Chapters 2 and 3), the course will begin in earnest with a systematic study of field extensions. We will next define Galois groups, splitting fields, normal extensions and separable polynomials, all of which lead up to the first main goal of the course: the **fundamental theorem of Galois theory**.

The second main goal of the course relates to **solution by radicals**. Specifically, we will prove that the polynomial $t^5 - 6t + 3$ over $\mathbf{Q}$ is not soluble by radicals. In order to do this, we will need a little bit more group theory than is covered in a first course on groups.

Final   Tuesday 7 June 8:00–10:00 am

Grading

I will base the grade on **homework** (there will be 3 homework assignments, each worth 20%), **presentations** (you will each participate in one of four 30-minute presentations at the end of the quarter, worth 20%), and the final (worth 20%). The presentation topics will be:

• Finite fields (Chapter 19)

• Regular polygons (Chapter 20)

• Circle division (Chapter 21)

• Calculating Galois groups (Chapter 22)

Office hours

My office hours are 3–3:50 on Mondays, Tuesdays, Thursdays and Fridays, in 216 Bond Hall. My phone number is 650 7569 and my e-mail is amites.sarkar@wwu.edu