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topics on field extensions and Galois theory

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## Definitions

1. extension field
2. simple field extension
3. <http://planetmath.org/Degreeedegree>
4. field adjunction
5. composite field
6. finite extension
7. algebraic extension
8. algebraic closure
9. abelian number field
10. abelian extension
11. biquadratic field
12. biquadratic extension
13. quadratic closure
14. cyclic extension
15. pure cubic field
16. number field
17. algebraically solvable
18. norm and trace of algebraic number
19. perfect field
20. cyclotomic field
21. cyclotomic extension
22. <http://planetmath.org/PExtension> $p$ -extension

- 23. radical
- 24. radical extension
- 25. solvable by radicals
- 26. expressible
- 27. normal extension
- 28. normal closure
- 29. separable extension
- 30. separable closure
- 31. splitting field
- 32. fixed field of a set of automorphisms
- 33. conjugate fields
- 34. Galois extension
- 35. Galois closure
- 36. Galois group
- 37. absolute Galois group
- 38. Galois connection
- 39. inverse Galois problem
- 40. function field
- 41. ray class field

## Field theory in relation to Euclidean geometry

1. Euclidean field
2. constructible numbers
3. motivation of definition of constructible numbers
4. compass and straightedge construction
5. theorem on constructible numbers
6. theorem on constructible angles
7. criterion for constructibility of regular polygon
8. classical problems of constructibility

## Galois theory

1. fundamental theorem of Galois theory
2. Galois group of the compositum of two Galois extensions
3. <http://planetmath.org/GaloisSubfieldsOfRealRootExtensionsAreAtMostQuadraticG>  
subfields of real radical extensions
4. <http://planetmath.org/CompositumOfAGaloisExtensionAndAnotherExtensionIsGalois>  
of a Galois extension and another extension
5. <http://planetmath.org/GaloisCriterionForSolvabilityOfAPolynomialByRadicals>  
crit for solvability of a polynomial by radicals
6. Hilbert Theorem 90
7. Shafarevich's theorem (finite solvable groups as Galois groups)
8. <http://planetmath.org/GaloisGroupsOfFiniteAbelianExtensionsOfMathbbQ>  
number fields with a particular finite abelian Galois group

## **Applications of Galois theory**

1. Galois group of a biquadratic extension
2. cubic formula
3. quartic formula
4. Galois group of a cubic polynomial
5. Galois group of a quartic polynomial
6. Galois-theoretic derivation of the cubic formula
7. proof of fundamental theorem of algebra
8. casus irreducibilis
9. Cardano's formulae
10. a condition of algebraic extension
11. primitive element theorem (Steinitz)