

Tutorato 7 AL310

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Exercise 1. Calculate the Galois group of the following polynomials in $\mathbb{Q}[x]$:

1. $x^4 + 10x^2 - 4x + 2$

2. $x^4 + x + 1$

3. $x^4 + 3x^2 + 1$

4. $x^4 + 8x + 12$

5. $x^4 + x^3 + x^2 + x + 1$

6. $x^4 - 2$

7. $(x^2 - 1)^2 - 8$

Exercise 2. Write the possible Galois groups of the polynomials with degree 4 in $\mathbb{F}_2[x]$.

Exercise 3. Calculate the Galois group of the polynomial $f(x) = x^4 - 8x^3 + 24x^2 - 32x + 14$ in $\mathbb{Q}[x]$ and $\mathbb{F}_3[x]$.

Exercise 4. Define the discriminant D_f of an irreducible polynomial $f \in F[x]$ with degree n and determine the discriminants of the polynomials Φ_7 and Φ_{389} .

Exercise 5. Write, if it's possible, an example of an extension of a finite field with Galois group isomorph to D_4 .

Exercise 6. Determine the Galois groups over \mathbb{Q} and \mathbb{F}_5 of the polynomial $f(x) = x^5 + 5x^4 + 10x^3 + 10x^2 + 5x - 4$.

Exercise 7. Determine the Galois groups over \mathbb{Q} and \mathbb{F}_7 of the polynomial $f(x) = x^5 - 3^5$.