# Tutorato 5 AL310

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Giovedì 22 novembre 2018

**Exercise 1.** *Let $\mathbb{F}_5[\alpha]$ the stem field with $\alpha^2 = 2$; determine his number of elements and write the generators of $\mathbb{F}_5[\alpha]^*$.*

**Exercise 2.** *Find the zeros of the polynomial $f(x) = x^{16} + x^{12} + 1$ in $\mathbb{F}_2[\alpha]$ with $\alpha^4 = \alpha + 1$.*

**Exercise 3.** *After describing the elements of $Aut(\mathbb{Q}(5^{\frac{1}{3}}, \sqrt{-3})/\mathbb{Q})$ determine the order of any of them.*

**Exercise 4.** *Describe the elements of the Galois group of the polynomial $f(x) = x^4 - 14x^2 + 9 \in \mathbb{Q}[x]$ and determine to which group $Gal(\mathbb{Q}_f/\mathbb{Q})$ is isomorph.*

**Exercise 5.** *Describe the elements of the Galois group of the polynomial $f(x) = x^4 - x^2 - 6 \in \mathbb{Q}[x]$ and determine to which group $Gal(\mathbb{Q}_f/\mathbb{Q})$ is isomorph.*

**Exercise 6.** *Describe the lattice of subfields of $\mathbb{Q}(\zeta_5)$.*

**Exercise 7.** *Describe $G = Aut(\mathbb{Q}_f/\mathbb{Q})$, where $\mathbb{Q}_f$ is the splitting field of the polynomial $f(x) = (x^2 + 1)(x^4 - 3)$. Calculate the order of the elements of $G$ and determine to which group it is isomorph.*