Problem 1: Consider the quintic polynomial $f(x) = x^5 - 2$ and let $E$ be its splitting field over $\mathbb{Q}$. What is the order of $\text{Gal}(E/\mathbb{Q})$? Is it abelian?

Problem 2: Find the splitting field $E$ of $x^4 + 2$ over $F = \mathbb{Z}_3$ and determine $\text{Gal}(E/F)$.

Problem 3: Consider the polynomial

$$x^4 - x^2 - 1$$

Find its splitting field over $\mathbb{Q}$, all of its subfields as well as their Galois correspondent subgroups.