1. Using any method you choose, find a primitive element of $F_9$. Demonstrate, by direct verification, that each of its conjugates with respect to $F_3$ is also a primitive element.

2. The set of automorphisms of $\mathbb{C}$ over $\mathbb{R}$ (i.e. the automorphisms of $\mathbb{C}$ which fix $\mathbb{R}$ pointwise) forms a group. Describe this group.  
*Hint:* begin by considering the effect of such an automorphism on $i \in \mathbb{C}$.

3. Let $K = F_q$ and let $F$ be a finite extension of $K$. Let $\alpha = \beta^q - \beta$ for some $\beta \in F$.
Prove that
$$\alpha = \gamma^q - \gamma \text{ with } \gamma \in F \iff \beta - \gamma \in K.$$  

4. Let $K = F_q$ and let $F = F_q^m$ be a finite extension of $K$.
Prove that: for $\alpha \in F$,
$$N_{F/K}(\alpha) = 1 \iff \alpha = \beta^{q-1} \text{ for some } \beta \in F^*.$$  

5. Prove that, if the order of basis elements is taken into account, then the number of different bases of $F_q^m$ over $F_q$ is
$$\left(q^m - 1\right)\left(q^m - q\right)\left(q^m - q^2\right) \cdots \left(q^m - q^{m-1}\right).$$