

In this thesis, we study the theory of elliptic curves, with the main focus on elliptic curves over finite fields. We present basic theory, taking several technical aspects into consideration (singularity of the curve, effect of field characteristic on the form of the equation of elliptic curve). We algebraically deduce and formulate the group law, that is the definition of addition on a set of points on elliptic curve). We prove a known result saying that the set of points on elliptic curve under addition forms a group. We present an elementary proof, some of the calculations will be carried out in computer program Mathematica due to their complexity. Finally, we study endomorphisms of elliptic curves over finite fields (homomorphisms on the set of points on elliptic curve that are defined by rational functions). Using obtained results, we prove the Hasse's theorem, which provides an estimate of the order of the group of points on elliptic curve over finite field.