2. Notation and Conventions.

Groups G will always act on the left. If M is a G-module and $\sigma \in G$, this action will be written either as $m \longmapsto \sigma(m)$ or $m \longmapsto {}^{\sigma}m$. We let M^G denote the sub-module of G-invariants. If M and N are G-modules, so is $\mathrm{Hom}(M,N)$: the action of σ on a homomorphism $f:M \longrightarrow N$ is given by

$$\sigma(f)(m) = \sigma(f(\sigma^{-1}m)) .$$

Rings will also act on the left. If M is an R-module and $r \in R$ we let $M_r = \{m \in M : rm = 0\}$ denote the sub-module of "r-torsion."

If A and B are elliptic curves (or, more generally, abelian varieties) defined over the field F, we let $\mathrm{Hom}_F(A,B)$ be the group of algebraic homomorphisms $\phi:A \longrightarrow B$ which are defined over F. If S is any F-algebra, we let $A(S)$ denote the abelian group of all S-rational points of A. If σ is any automorphism of F we write ${}^{\sigma}A$ and ${}^{\sigma}B$ for the conjugate varieties, and ${}^{\sigma}\phi$ for the conjugate homomorphism from ${}^{\sigma}A$ to ${}^{\sigma}B$.

If F is a field, $\overline{F}$ denotes an algebraic closure of it. We shall always use the isomorphism of local class field theory which takes a uniformizing parameter to an _arithmetic_ Frobenius in the Galois group.