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Application of formal groups to reciprocity laws

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Formal groups are easily defined algebraic objects that have a wide range of applications in many field of mathematics from cobordism theory to number theory with the present talk being devoted to the latter. They are defined as formal power series F in two variables such that $F(x,0) = x$; $F(F(x,y),z) = F(x,F(y,z))$ and $F(x,y) = F(y,x)$. A relation between formal groups and reciprocity laws is investigated following the approach by Honda. Let ξ denote an m-th primitive root of unity. For a character χ of order m, we define two one-dimensional formal groups over $\mathbb{Z}[\xi]$ and prove the existence of an integral homomorphism between them with linear coefficient equal to the Gauss sum of χ. This allows us to deduce a reciprocity formula for the m-th residue symbol which, in particular, implies the cubic reciprocity law.