

**M. Arkowitz
C. R. Curjel**

Groups of Homotopy Classes

4

Rank formulas and homotopy-commutativity



Springer

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introducing pro algebraic groups In char0 the situation is clear In characteristic different from zero information on finite group schemes is needed in order to handle group schemes this information can be found in work of GABRIEL In the second chapter these ideas of SERRE and GABRIEL are put together Also extension groups of elementary group schemes are determined A suggestion in a paper by MANIN gave crystallization to a feeling of symmetry concerning subgroups of abelian varieties In the third chapter we prove that the dual of an abelian scheme and the linear dual of a finite subgroup scheme are related in a very natural way Afterwards we became aware that a special case of this theorem was already known by CARTIER and BARSOTTI Applications of this duality theorem are the classical duality theorem duality hypothesis proved by CARTIER and by NISHI calculation of $\text{Ext}^i(A, A)$ where A is an abelian variety result conjectured by SERRE a proof of the symmetry condition due to MANIN concerning the isogeny type of a formal group attached to an abelian variety

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