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Foundations of Grothendieck Duality for Diagrams of Schemes

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Preface

This volume contains two related, though independently written, monographs.

In *Notes on Derived Functors and Grothendieck Duality* the first three chapters treat the basics of derived categories and functors, and of the rich formalism, over ringed spaces, of the derived functors, for unbounded complexes, of the sheaf functors $\otimes$, $\mathcal{H}om$, f_* and f^* where f is a ringed-space map. Included are some enhancements, for concentrated (i.e., quasi-compact and quasi-separated) schemes, of classical results such as the projection and Künneth isomorphisms. The fourth chapter presents the abstract foundations of Grothendieck Duality—existence and tor-independent base change for the right adjoint of the derived functor $\mathbf{R}f_*$ when f is a quasi-proper map of concentrated schemes, the twisted inverse image pseudofunctor for separated finite-type maps of noetherian schemes, refinements for maps of finite tor-dimension, and a brief discussion of dualizing complexes.

In *Equivariant Twisted Inverses* the theory is extended to the context of diagrams of schemes, and in particular, to schemes with a group-scheme action. An equivariant version of the twisted inverse-image pseudofunctor is defined, and equivariant versions of some of its important properties are proved, including Grothendieck duality for proper morphisms, and flat base change. Also, equivariant dualizing complexes are dealt with. As an application, a generalized version of Watanabe's theorem on the Gorenstein property of rings of invariants is proved.

More detailed overviews are given in the respective Introductions.

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