

Introduction to Derived Categories

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We outline the construction of the derived category $D(M)$ of an abelian category M . We then define left and right derived functors. We introduce K -projective, K -injective and K -flat resolutions, and prove existence of some derived functors when M is either the category of modules over a ring, or the category of sheaves of modules over a sheaf of rings. DG algebras and their derived categories will also be mentioned.

Next we discuss some more specialized topics: dualizing complexes (commutative and noncommutative), two-sided tilting complexes, derived Morita theory (for DG algebras), and perverse sheaves.