

Homology and Rings

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abstract

The purpose of this lecture is to present some classical applications of homological methods to ring theory. After a quick review of the notion of global dimension, we will see how the derived functors Ext and Tor apply to produce celebrated results about rings. In particular, we will present an outline of the proof of Hilbert's syzygy theorem, computing the left global dimension of a ring of polynomials $R[x]$ in terms of the left global dimension of R . Finally, we will state Serre-Auslander-Buchsbaum's theorem, which characterizes regular noetherian local rings in terms of their global dimension, and, time permitting, we will see a sketch of its proof.

References

- [1] J. Rotman, *An introduction to Homological Algebra*. New York: Universitext Springer, 2009.