

Thesis advisor

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Abstract

Almost 50 years ago, Auslander, Buchsbaum and Serre used homological methods to characterize regular local rings as noetherian local rings with finite global dimension. This means that every module over such a ring has a finite projective dimension. Their characterization opened an active area of research in homological algebra. The main theme of the present thesis is in this line of thought.

This thesis is divided into two parts. In the first part we mainly study the homological dimension of a module which is not necessarily finitely generated. We prove a dual result of the well-known Auslander-Bridger formula. In his thesis [88], T. Sharif defined and studied the notion of complete intersection flat dimension. Here we continue Sharif's investigation and introduce the notion of Cohen-Macaulay flat dimension with the same approach. We derive some relations between these dimensions and other existing homological dimensions.

The subject of the second part is the semistar multiplicative ideal theory. More precisely, we deal with the going-down property of extensions of integral domains. To achieve this, we develop the theory of \star -GD domains and derive their fundamental properties. Then we give new characterizations of P \star MDs in terms of \star -GD domains.