



# Algebra: Rings, Modules and Categories I (Grundlehren der mathematischen Wissenschaften)

*By Carl Faith*

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## **Algebra: Rings, Modules and Categories I (Grundlehren der mathematischen Wissenschaften)** By Carl Faith

VI of Oregon lectures in 1962, Bass gave simplified proofs of a number of "Morita Theorems", incorporating ideas of Chase and Schanuel. One of the Morita theorems characterizes when there is an equivalence of categories  $\text{mod-}A$   $R::! \text{mod-}B$  for two rings  $A$  and  $B$ . Morita's solution organizes ideas so efficiently that the classical Wedderburn-Artin theorem is a simple consequence, and moreover, a similarity class  $[A]$  in the Brauer group  $\text{Br}(k)$  of Azumaya algebras over a commutative ring  $k$  consists of all algebras  $B$  such that the corresponding categories  $\text{mod-}A$  and  $\text{mod-}B$  consisting of  $k$ -linear morphisms are equivalent by a  $k$ -linear functor. (For fields,  $\text{Br}(k)$  consists of similarity classes of simple central algebras, and for arbitrary commutative  $k$ , this is subsumed under the Azumaya [51]1 and Auslander-Goldman [60] Brauer group.) Numerous other instances of a wedding of ring theory and category (albeit a shot gun wedding!) are contained in the text. Furthermore, in my attempt to further simplify proofs, notably to eliminate the need for tensor products in Bass's exposition, I uncovered a vein of ideas and new theorems lying wholly within ring theory. This constitutes much of Chapter 4 -the Morita theorem is Theorem 4. 29-and the basis for it is a correspondence theorem for projective modules (Theorem 4. 7) suggested by the Morita context. As a by-product, this provides foundation for a rather complete theory of simple Noetherian rings-but more about this in the introduction.

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