

## NON-COMMUTATIVE DERIVATION MODULES

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Derivation modules in this thesis are different from the usual derivation modules defined only for commutative algebras, and are in the sense of those in Bergman's paper defined for arbitrary algebras that are not necessarily commutative. First, a construction of universal derivation modules of an algebra is given in a way entirely different from that given in Bergman's paper. Thereby, it is proved in this thesis that a universal derivation module of an algebra exists and is unique up to unique isomorphism in the category of derivation modules. Secondly, when  $A$  is a free join of a family of its subalgebras  $(A_\alpha)_{\alpha \in I}$ , a relation between the universal derivation modules of  $A$  and  $A_\alpha$  are established. This relation gives a very clear description of the structure of the universal derivation modules of a free algebra  $R[X]$ , where  $X$  is a set of algebra generators. Thirdly, a relation between universal derivation modules of two algebras  $A$  and  $B$  are studied when there is onto algebra homomorphism from  $A$  to  $B$ . The last part of this thesis is an observation of universal derivation modules of fractional extensions of an algebra and it is proved that if the universal derivation module of an algebra is zero, then the universal derivation modules of the fractional extension are also zero.

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