

Kronecker Modules and Reductions of a Pair of Bilinear Forms ^{*}

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Abstract

We give a short overview on the subject of canonical reduction of a pair of bilinear forms, each being symmetric or alternating, making use of the classification of pairs of linear mappings between vector spaces given by J. Dieudonné.

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The problem of a simultaneous reduction of a pair of symmetric bilinear forms over a given field is classic: this problem has been solved, for fields of characteristic zero, in 1868 by K. Weierstrass, under the assumption that both the forms are not degenerate. Two papers, the first of which by L. Kronecker [4], dated 1890, the second by L. E. Dickson [1], dated 1909, give a complete answer for fields of characteristic zero. Later J. Williamson [9] (1935), [10] (1945) showed that similar results were also valid for any field of characteristic $\neq 2$, but the condition that one of the form is not degenerate is needed again. The case where both the forms are degenerate has been solved by W. Waterhouse [7] (1976), as well as the case of a pair of symmetric bilinear forms (even degenerate) over a field of characteristic 2, [8] (1977).

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