

1014-13-533

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Let  $k$  be an algebraically closed field of arbitrary characteristic and let  $G$  be a subgroup of  $GL(n, k)$ . When  $\text{char } k = 0$ , a classical theorem of nineteenth century invariant theory states that the polynomial invariants of  $G$  for any number of vectors, say  $m$ , are known once the polynomial invariants of  $G$  for  $n$  vectors are known. In fact, the invariants of  $m$  vectors can be obtained from those of  $n$  vectors by polarization. Our purpose is to extend this theorem to fields of arbitrary characteristic. Here, the theorem is not true in general. However, we shall show that polarization determines the invariants of  $m$  vectors up to integral closure. This result (as is the case in characteristic 0) is closely related to the natural action of  $GL(m, k)$  on the space of  $m$  vectors. We shall explain the connections to representation theory and give applications to the invariants of finite groups. (Received September 20, 2005)