MEMOIRS OF THE COLLEGE OF SCIENCE, UNIVERSITY OF KYOTO, SERIES A
Vol. XXX, Mathematics No. 3, 1957.

Note on a paper of Lang concerning quasi algebraic closure

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(Received June 10, 1957)

As was defined by Lang,[1] a field K is said to be C_i if every homogeneous form in K in n variables and of degree d with $n>d^i$ has a non-trivial zero in K; K is said to be strongly C_i if every polynomial in K in n variables, without constant term and of degree d with $n>d^i$ has a non-trivial zero in K.

Defining further more the notion of normic forms of order i,[2] he proved the following theorems:

(1) Let K be a C_i field admitting at least one normic form of order i. Let $f_1, \cdots, f_r$ be r homogeneous forms in K in n common variables each of degree d. If $n>rd^i$, then the forms have a non-trivial common zero in K.

(2) With the same K as above, a function field L over K is C_{i+r} with $r=\dim_K L$. If K is strongly C_i and if K admits normic forms of any given degree, then L is strongly C_{i+r}.

The purpose of the present note is to prove these theorems without assuming the existence of normic forms. Afterwards, we shall offer some related questions.

§ 1. The main theorems.

We shall prove here the following theorems:

THEOREM 1a. *Let $f_1, \cdots, f_r$ be r homogeneous forms in n common variables each of degree d in a C_i field K. If $n>rd^i$, then the forms have common non-trivial zero in K.*

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1) S. Lang, On quasi algebraic closure, Ann. of Math, vol. 55, pp. 373-390 (1952).

2) Since we shall not make use of the notion of normic forms, we shall not recall the definition of the notion.