

FREE EXTERIOR POWERS

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Our purpose is to announce several results concerning a unital module M over a commutative ring R with unity.

THEOREM 1. *Let M be a module over the ring R . Suppose for some p that $\wedge^p M$ is free of rank one. Then*

- (i) M is finitely generated, projective, and reflexive;
- (ii) the module $M^* = \text{Hom}(M, R)$ has the same properties, and $\wedge^p M^*$ is free of rank 1; and
- (iii) for each q , $0 \leq q \leq p$,

$$\wedge^q M^* \approx (\wedge^q M)^* \approx \wedge^{p-q} M.$$

COROLLARY 1. *If the module M of Theorem 1 has a pure p -vector for a basis, then M is free.*

COROLLARY 2 (H. OSBORN). *If the ring R in Theorem 1 is a local ring, then M is free.*

THEOREM 2. *Let M be a module over the ring R . Suppose for some p that $\wedge^p M$ is cyclic. Then $\wedge^{p+1} M = 0$.*

THEOREM 3. *Let M be a module over the ring R . Suppose for some p that $\wedge^p M$ is free of finite rank q . Then $\wedge^{p+q} M = 0$.*

A detailed paper will be submitted elsewhere.

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