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## Artin-Rees theorem

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Let  $A$  be a Noetherian ring,  $\mathfrak{a}$  an ideal,  $M$  a finitely generated module, and  $N$  a submodule. Then there exists an integer  $k \geq 1$  such that for all integers  $n \geq 1$  we have

$$\mathfrak{a}^n M \cap N = \mathfrak{a}^{n-k}(\mathfrak{a}^k M \cap N).$$