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2. Algebra

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Asymptotic behaviour of attached primes

Let R be a commutative ring with identity and I an ideal of R. Let A be an Artinian R module. Ratliff has shown that the sequence $Ass(R/\overline{I^n})$ is constant for large n, where the bar denotes ordinary integral closure. Sharp and Taherizadeh provided Artinian analogues for the theory of integral closures by defining the integral closure of an ideal relative to an Artinian module A, denoted by I^* . They formulated the following open questions that are dual to Raliff's results:

(i) Is it the case that $Att(0:_A (I^i)^*) \subseteq Att(0:_A (I^{i+1})^*)$ for all $i \in \mathbf{N}$?

(ii) Is the sequence of sets $(Att(0:_A (I^n)^*))_{n\in\mathbf{N}}$ ultimately constant?

In this lecture the closure of an ideal I with respect to a submodule N of a Noetherian module M is defined by means of an integer valued filtration on the ring R. An Artinian anologue is also defined, namely the closure $\bar{I}_{k,B}$ of I^k relative to a submodule B of an Artinian module A. The main result of this lecture is a positive answer to the question above, with $Att(0:_A (I^i)^*)$ replaced by $Att(B:_A \bar{I}_{i,B})$.