

Problem Set 4

To solve these problems, you are not allowed to use any additional Macaulay2 packages besides the `Complexes` package and the ones that are automatically loaded with Macaulay2.

Problem 1. Let k be any field and consider the prime ideal in $k[x, y, z]$

$$P = (x^3 - yz, y^2 - xz, z^2 - x^2y)$$

defining the curve parametrized by (t^3, t^4, t^5) . Give (with proof!) two different ideals J such that $P^{(n)} = (P^n : J^\infty)$ for all $n \geq 1$, and test your proposed ideals J in Macaulay2 with your own choice of k and n .

Problem 2. Let R be a finitely generated k -algebra, and P a prime ideal in R . Show that $P^{(n)}$ is P -primary for all $n \geq 1$.