Algebraic Geometry WS 2023/2024
RPTU Kaiserslautern–Landau

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Exercise Sheet 10

Release: January 25, 2024
Deadline: **February 1, 2024 by 10:00 a.m. Kaiserslautern**

Each exercise is worth 4 points. You need a minimum of 50% of the total points of all exercise sheets by the end of the semester in order to obtain the "Schein". Submit your solutions via OLAT by uploading **one** pdf-file with all your solutions **before 10:00 a.m.** Kaiserslautern.

You may submit your solution individually or in a group of at most 2 people. If you opt for a group submission, state the names of both individuals on the first page of the submitted pdf-file.

Exercises with numbers in brackets are taken from the book "An invitation to algebraic geometry" by Smith et. al. (2000).

Exercise 1 [5.5.2]**.** Find an example of two plane projective curves that are isomorphic but have different degrees.

Exercise 2 [5.5.3]**.** Find an example of two plane projective curves that have the same degree but are not isomorphic.

Exercise 3 [5.6.1]**.** Assume that the variety $V \subset \mathbb{P}^n$ has the Hilbert polynomial P. Calculate the Hilbert polynomial of the image variety $\nu_d(V) \subset \mathbb{P}^{\binom{n+d}{d}-1}$ under the degree-d Veronese map.

Exercise 4. Suppose $V = \{p_1, p_2, p_3\} \subset \mathbb{P}^2$ consists of three points. Compute the Hilbert function of V.