

PROBLEM SET 9 (DUE ON TUESDAY, DEC 4)

(All Exercises are references to the November 18, 2017 version of *Foundations of Algebraic Geometry* by R. Vakil.)

- Problem 1.** Let X, Y be Z -schemes and let $\pi : X \rightarrow Y$ be a morphism of Z -schemes. Suppose that π is surjective and X is universally closed (in other words, the structure morphism to Z is universally closed). Show that Y is universally closed.
- Problem 2.** Exercise 11.1.B (dimension can be computed via an open cover)
- Problem 3.** Exercise 11.1.C (a zero-dimensional Noetherian scheme has a finite number of points)
- Problem 4.** Suppose that X and Y are irreducible Noetherian schemes of dimension 1 with the same cardinality. Show that the underlying topological spaces of X and Y are homeomorphic. Show that this is no longer necessarily true if X and Y are dimension 2 instead of 1.