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 $\pi : X \to Y$ be a morphism of $Z$-schemes. Suppose that $\pi$ 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.