PROBLEM SET 9 (DUE ON NOV 17)

(All Exercises are references to the December 29, 2015 version of *Foundations of Algebraic Geometry* by R. Vakil.)

Problem 1. Let $n \geq 2$ be an integer. Compute the (maximal) domain of definition of the generalized Cremona transformation

$$C : \mathbb{P}^n_{\mathbb{C}} \dashrightarrow \mathbb{P}^n_{\mathbb{C}},$$

a rational map given by $[x_0 : \cdots : x_n] \mapsto [x_0^{-1} : \cdots : x_n^{-1}]$ (on closed points with $x_0 \cdots x_n \neq 0$).

Problem 2. Let X, Y be Z-schemes and let $\pi : X \to Y$ 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 3. Exercise 11.1.C (a zero-dimensional Noetherian scheme has a finite number of points)

Problem 4. Exercise 11.2.D (a surface cut out by three equations in $\mathbb{A}^4$)