18.726, Homework 2
Due Thursday March 3, 11.00 am

1. Recall we showed in class that, given a reduced scheme X over a base scheme S and a separated morphism $Y \to S$, then any morphism $U \to Y$ from an open dense subscheme $U \subset X$ has at most one extension to a morphism $X \to Y$. Give a counterexample if we weaken the constraint that X is reduced, or if we weaken the constraint that Y is separated over S.

2. Given a rational map from a nonsingular, reduced, irreducible variety X over k to a proper variety Y, show that there exists a maximal open set $U \subset X$ such that the rational map comes from an actual morphism $U \to Y$ and show that the complement of U is codimension at least two everywhere. In the case of the rational map $\mathbb{P}^2_k - - \to \mathbb{P}^2_k$ defined by $[x : y : z] \to [1/x, 1/y, 1/z]$ what is the maximal domain of definition?

3. Exercises from Hartshorne II.3:

    1. Closed immersions: 3.11 (assume exercises from section 2 mentioned)
    2. Chevalley's theorem: 3.19 (I know you covered this last semester, but the statement holds more generally)

4. Exercises from Hartshorne II.4:

    1. 4.1
    2. 4.7
    3. 4.10: Chow's Lemma.

5. Exercises from Hartshorne II.5:

    1. 5.8