PROBLEM SET 3 (DUE ON THURSDAY, OCT 18)

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

Problem 1. Exercise 4.3.A (classifying isomorphisms of affine schemes)

Problem 2. Exercise 4.3.G (functions on locally ringed spaces)

Problem 3. Let $X_1 = \operatorname{Spec} k[x, y]$ and $X_2 = \operatorname{Spec} k[w, z]$ be two copies of the affine plane over a field k. Let X be the scheme formed by gluing X_1 and X_2 along the isomorphism of open subschemes $\operatorname{Spec} k[x, x^{-1}, y] \cong \operatorname{Spec} k[w, w^{-1}, z]$ induced by the ring isomorphism $k[x, x^{-1}, y] \cong k[w, w^{-1}, z]$ given by $x \mapsto w, y \mapsto w^{-1}z$. Compute the ring of global sections of the structure sheaf of X. Is X affine?

Problem 4. Exercise 5.1.B (irreducible closed subsets of general schemes are closures of points)

Problem 5. Exercise 4.5.E(a) (prime ideals of $(S_\bullet[\frac{1}{f}])_0$)

Problem 6. Is $\operatorname{Proj} k[x, y]/(x^2y)$ affine, where x and y have degree 1?