PROBLEM SET 1 (DUE ON TUESDAY, FEB 26)

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

Problem 1. Exercise 13.3.F (pushforwards of quasicoherent sheaves are quasicoherent)

Problem 2. Exercise 13.7.F (local freeness can be checked at stalks)

Problem 3. Exercise 14.2.O (computing $\mathrm{Pic}(\mathbb{P}^1 \times \mathbb{P}^1)$)

Problem 4. Exercise 14.3.B (interpreting $\mathcal{O}(-D)$ as an ideal sheaf)

Problem 5. Classify all morphisms (of quasicoherent sheaves on $\mathbb{P}^1_k$)

$$\mathcal{O}_{\mathbb{P}^1_k}(m) \to \mathcal{O}_{\mathbb{P}^1_k}(n)$$

for $m, n \in \mathbb{Z}$.

Problem 6. Let $X = \mathrm{Bl}_{(0,0)} \mathbb{A}^2_k$ be the blow-up of the affine plane at the origin (as described in Exercise 9.3.F). Compute $\mathrm{Pic}(X)$.