PROBLEM SET 3 (DUE ON THURSDAY, MARCH 21)

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

Problem 1. Exercise 17.1.G (total space of a vector bundle)

Problem 2. Exercise 17.4.D (understanding the degree of a map between curves in terms of fibers over closed points - you will want to read the preceding page or so, and it is worth noting that Exercise 17.4.C is complementary, explaining how to understand degree in terms of fibers over non-closed points)

Problem 3. Exercise 18.2.H (cohomology respects change of base field - for this and the following problem, you may want to wait until we discuss Čech cohomology on Thursday)

Problem 4. Suppose $n \geq 2$ and let $X = \mathbb{A}_k^n \setminus \{0\}$ be the complement of the origin in affine n-space over a field k. Compute all the cohomology groups $H^i(X, \mathcal{O}_X)$. (Two possible ways of doing this: (a) directly using Čech cohomology; (b) by using an affine morphism $\pi : X \to \mathbb{P}_k^{n-1}$ and reducing to the computation of the cohomology of line bundles on projective space (Theorem 18.1.3).)