PROBLEM SET 6 (DUE ON THURSDAY, MAY 2)

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

Problem 1. Exercise 19.11.B (a map of projective varieties not arising from a map of (regraded) graded rings)

Problem 2. Exercise 21.2.K (pullback of differentials; this affine statement gives the global statement in Theorem 21.2.27)

Problem 3. Suppose (E, p) is a (smooth) elliptic curve in Weierstrass form $y^2 = x^3 + ax + b$ (along with the point at infinity p, so really $E = \operatorname{Proj} k[x, y, z]/(y^2 z - x^3 - axz^2 - bz^3)$). Show that the rational section dx/y of $\Omega_{E/k}$ actually has no zeroes or poles in E, so it generates $\Omega_{E/k} \cong \mathcal{O}_E$.