

PROBLEM SET 1 (POSTED ON THURSDAY, JANUARY 15)

(All Exercises are references to the October 21, 2025 version of *Foundations of Algebraic Geometry* by R. Vakil.)

- Problem 1.** Exercise 15.4.N (a generalization of the Qcqs lemma: sections of a twist of a quasicohherent sheaf by a high power of a line bundle (“twist” is the general term for modifying a sheaf by tensoring with a line bundle))
- Problem 2.** Exercise 14.3.E (being a vector bundle can be checked on stalks - note here \mathcal{F} is assumed to be finitely presented, i.e. the modules $\mathcal{F}(\text{Spec } A)$ are finitely generated and finitely presented - this is an intermediate condition between being finitely generated and being coherent)
- Problem 3.** Exercise 14.3.M (degrees of finite morphisms at points)