Math 256B. Homework 6

Due Wednesday 6 March

1. [This exercise generalizes II Ex. 5.9b.] Let A be a noetherian ring, let S be a graded ring, finitely generated by S_1 over S_0, and assume that $S_0 = A$. Let M be a finitely-generated graded S-module. By (II Ex. 5.9a), there is a natural map $\alpha \colon M \to \Gamma_*(\widetilde{M})$. Let $X = \operatorname{Proj} S$.

    Show that the map α is an isomorphism in all large enough degrees; i.e.,

    $$\alpha_d \colon M_d \to \Gamma(X, \widetilde{M}(d))$$

    is an isomorphism for all $d \gg 0$. Use cohomology. [*Hint*: Use methods from the proof of (III, 5.2).]

2. Hartshorne III Ex. 5.3.

3. **[WITHDRAWN]**

4(NC). Hartshorne III Ex. 5.10.