

**Math 203B (Algebraic Geometry), UCSD, winter 2020**  
**Problem Set 6 (due Wednesday, February 26)**

Solve the following problems, and turn in the solutions to at least *four* of them.

1. Let  $k$  be a field. Let  $\mathcal{L}$  be an invertible sheaf on  $\mathbb{P}_k^n$  which is generated by global sections. Prove that  $\mathcal{L} \cong \mathcal{O}(d)$  where  $d$  is the degree of the hypersurface cut out by any nonzero section of  $\mathcal{L}$ . Then use this to finish the proof that the automorphism group of  $\mathbb{P}_k^n$  is  $\mathrm{GL}(n+1, k)/k^\times$ .
2. Hartshorne exercise II.5.12 (both parts).
3. Hartshorne exercise II.5.14.
4. Hartshorne exercise II.6.12.
5. Hartshorne exercise II.7.1.
6. Hartshorne exercise II.7.6(a).