Math 553, Lesieutre
Problem set #3
due February 3, 2016

1. II.2.12

2. II.2.14a,b,c

3. II.2.18

4. Suppose that S is a $\mathbb{Z}$-graded ring. Show that an ideal $I \subset I$ is homogeneous if and only if it contains the degree n part of each of its elements (for all n). Check that the quotient S/I inherits a graded structure.

5. Let $S = k[x_1, \ldots, x_n]$, and consider the subring $S_{(d)}$ generated by homogeneous elements with degree divisible by d. There is an induced map $\mathrm{Proj}(S) \to \mathrm{Proj}(S_{(d)})$ (why?). Show that it is an isomorphism.

6. II.3.1

7. II.3.4