

## Math 256A. Problem Set #10

Due Thursday, 12 November

1. Fix a scheme  $S$ . An  $S$ -scheme  $X$  gives rise to a contravariant functor  $\underline{X}: \text{Sch}(S) \rightarrow \text{Sets}$  by letting

$$\underline{X}(S') = \text{Hom}_S(S', X).$$

Show that two  $S$ -schemes  $X$  and  $Y$  are isomorphic (as  $S$ -schemes) if and only if the functors  $\underline{X}$  and  $\underline{Y}$  are isomorphic as functors. (The latter means that there are natural transformations  $T: \underline{X} \rightarrow \underline{Y}$  and  $U: \underline{Y} \rightarrow \underline{X}$  such that  $U \circ T$  and  $T \circ U$  are the identity natural transformations on  $\underline{X}$  and  $\underline{Y}$ , respectively.)

2. Exercise 2.16.
3. Exercise 2.19.
4. Exercise 3.3.