# Algebraic Geometry 1
# Exercises Tutorium 7

Dr. Tom Bachmann                                                                    Winter Semester 2020–21

**Exercise 1.** Give an example of a morphism of sheaves which is an epimorphism, but not an epimorphism when viewed as a morphism of presheaves.

**Exercise 2.** Give an example showing that the forgetful functor from sheaves to presheaves does not preserve binary coproducts (in general).

**Exercise 3.** Let $X$ be an affine algebraic variety over the algebraically closed field $k$. Show that $\mathcal{O}_X(X)$ can be identified with the set of morphisms from $X$ to $\mathbb{A}^1_k$.

**Exercise 4.** Show that in the previous exercise, the assumption "affine" may be omitted.

**Exercise 5.** Let $X$ be an algebraic variety over the algebraically closed field $k$. Given $Z \subset X$ closed, denote by $I_Z \subset \mathcal{O}_X$ the subsheaf consisting of those regular functions vanishing along $Z$. Show that this induces an injection from the set of closed subsets of $X$ to the set of subsheaves of $\mathcal{O}_X$. Can you characterize its image?