

# Algebraic Geometry WS20

## Exercise set 7.

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All schemes and morphisms are assumed to be over a field  $k$ .

**Problem 1.** Show that for an arbitrary scheme  $X$  the set of morphisms  $X \rightarrow \mathbb{A}^1$  coincides with the set of elements of  $O_X(X)$ . What about the set of morphisms  $X \rightarrow \mathbb{A}^2$ ?

**Problem 2** (Hartshorne, p. 22, Ex. 3.11). Let  $X$  be a scheme and let  $x \in X$  be a point. Show that irreducible subschemes  $Z \subset X$  are in bijection with the prime ideals of the local ring  $O_{X,x}$ .

**Problem 3.** Construct a morphism from  $\mathbb{A}^2 \setminus \{(0,0)\}$  to  $\mathbb{P}^1$ . Show that every morphism from  $\mathbb{P}^1$  to  $\mathbb{A}^1$  is constant.

**Problem 4.** Construct a surjective morphism  $X \rightarrow \mathbb{P}^1$  where  $X$  is an affine scheme.

*Due date: 27.11.2020, 9:45*