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23.01.2014

13. Exercise sheet Algebraic Geometry I

All solutions have to be completely justified.

Aufgabe 1 Let X and Y be two schemes over a scheme S. Let $\{X_i\}_{i\in I}$ be an open covering of X and assume that $X_i \times_S Y$ exists for all $i \in I$. Prove that $X \times_S Y$ exists.

Aufgabe 2 Let X and Y be two schemes over a scheme S.
(a) Show that if $X \to S$ is a closed immersion, then the projection $X \times_S Y \to Y$ is a closed immersion.
(b) Show that if $X \to S$ is separated, then the projection $X \times_S Y \to Y$ is separated.

Aufgabe 3 Let X be a separated scheme over an affine scheme S. Let U and V be two open affine subschemes of X. Show that $U \cap V$ is affine. Give an example to show that this fails if X is not separated.