

# Liu problem

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Liu の演習問題の解答をまとめておく.

## 1 Sometopics incommutative algebra

## 2 Generalproperties of schemes

### 2.1 Spectrum of a ring

### 2.2 Ringed topological spaces

**Exercise 1.** Determine the sheaf associated to the presheaf  $A_X$  of Example 2.4. Such a sheaf is called a constant sheaf. Show that  $A_X$  is a sheaf if and only if every non-empty open subset of  $X$  is connected.

**Exercise 2.** Let  $\mathcal{F}$  be a sheaf on  $X$ . Let  $s, t \in \mathcal{F}(X)$ . Show that the set of  $x \in X$  such that  $s_x = t_x$  is open in  $X$ .

*Proof.* germ の定義から  $s_x = t_x$  となる場合, ある開集合  $U_x$  が存在し,  $\rho_{U_x}(s) = \rho_{U_x}(t)$  となる. この時, 任意の  $y \in U_x$  に対し,  $s_y = t_y$  となる. そのため, the set of  $x \in X$  such that  $s_x = t_x$  は  $\cup_x U_x$  となり, 開集合になる.  $\square$