Exercise 1. Let (X, O) be a locally ringed space, and $f \in O(X)$ a global section. Let the distinguished set $D(f) \subset X$ be defined by $D(f) = \{x \in X \mid f \notin \mathfrak{m}_x\}$.
(i) Show that $D(f)$ is open in X.
(ii) Show that under the natural map $O(X) \to O(D(f))$ the element f maps to a unit in $O(D(f))$.

Exercise 2. Let $(R, \mathfrak{m})$ be a local ring and X a scheme.
(i) If $f\colon \operatorname{Spec} R \to X$ is a morphism, then any open set in X containing $f(\mathfrak{m})$ contains the image of f.
(ii) Let x be a point in X. The set of morphisms $f\colon \operatorname{Spec} R \to X$ such that $f(\mathfrak{m}) = x$ is in bijection with the set of local homomorphisms $O_{X,x} \to R$.

Exercise 3. Let R be a ring. Then every irreducible closed subset of $\operatorname{Spec} R$ equals $V(\mathfrak{p})$ for some prime ideal $\mathfrak{p}$ of R, and $\mathfrak{p}$ is its unique generic point. (For generic point, see [HAG], Exercise II.2.7.)

Exercise 4. Give an example of a local ring $(R, \mathfrak{m})$ such that $\operatorname{Spec} R$ is reduced but not irreducible. Also give an example of a local ring $(R, \mathfrak{m})$ such that $\operatorname{Spec} R$ is irreducible but not reduced.

Exercise 5. Let k be an algebraically closed field. Let $X = (t(V), O_{t(V)})$ be the scheme associated to a variety V over k (cf. [HAG], Proposition II.2.6). Let $x \in X$ be a point. The following statements are equivalent:
(i) x is closed in X;
(ii) x is closed in U for all open affine neighborhoods $U \subset X$ of x;
(iii) x is closed in U for some open affine neighborhood $U \subset X$ of x.

Exercise 6. Give an example of: a scheme X, an affine open subset $U \subset X$, and a point $x \in U$ such that x is closed in U but x is not closed in X.