Problem 1. Let $U : \text{Top} \to \text{Set}$ denote the underlying set functor.

a. Show that $U$ has a left adjoint, and describe it explicitly.

b. Show that $U$ has a right adjoint, and describe it explicitly.

Problem 2. Show that the category $\text{Top}$ is complete (i.e. has all small limits).

*Remark.* A similar argument will show that $\text{Top}$ is cocomplete (i.e. has all small colimits). It is not assigned as homework, but is a recommended exercise.