

§ 2.1 Armstrong

1. (20 points) Let X and Y be topological spaces and show that if $f : X \rightarrow Y$ is continuous, then $f^{-1}(E)$ is closed for each closed set $E \subset Y$.
2. (20 points) (2.2.17) Let Y denote the set of real numbers with the topology

$$\mathcal{T} = \{\emptyset\} \cup \{U : U^c \text{ is a finite set}\}.$$

Let \mathbb{R}^1 denote the real numbers with the usual Euclidean topology. Show that $f : Y \rightarrow \mathbb{R}^1$ by $f(x) = x$ is **not** continuous.

3. (20 points) Let $\bar{A} = A \cup \text{clus}(A)$ and $\partial A = \bar{A} \setminus \text{int}(A)$. Show $\bar{A} = A \cup \partial A$.