A. Section 16 Exercise 1

B. In $\mathbb{R}$, find a homeomorphism between $(0,1)$ and any other finite open interval (a,b). Also find a homeomorphism between $(0,1)$ and $\mathbb{R} = (-\infty, \infty)$. (You may use the fact, which we have not proved yet, that continuity in $\mathbb{R}$ and its subspaces matches continuity as defined in calculus.)

C. Let $Y = \{1, 1/2, 1/3, 1/4, 1/5, \ldots\}$ and let $Z = Y \cup \{0\}$, both with their subspace topologies from $\mathbb{R}$. Is Y discrete (meaning, a space with the discrete topology)? Is Z discrete?

D. What happens if you carry out the construction of the quotient topology on Y, for a function $f : X_T \to Y$ that is not surjective?

E. Consider the surjection $f : \mathbb{R}_{\text{std}} \to [0, \infty)$ given by $f(x) = x^2$. Endow $[0, \infty)$ with the quotient topology induced by f. How does it compare to the subspace topology on $[0, \infty) \subseteq \mathbb{R}_{\text{std}}$?

(Also, I invite you to consider the surjection $f : \mathbb{R}_{\text{std}} \to \mathbb{R}$ given by an odd-degree polynomial. What is the quotient topology on $\mathbb{R}$, if $f(x) = x^3$? If $f(x) = x^3 + x$? If $f(x) = x^3 - x$? But you are not asked to hand in answers to these questions.)