Homework 9: The Quotient Topology

*Assignments should be **stapled** and written clearly and legibly.*

1. §3.3, #3.23, 3.24, 3.27, 3.33(a)(b)(c)(h)(j)(k)
2. Let X and S be sets, and let $\pi : X \to S$ be a surjective map. Define a relation $\sim$ on X by $x \sim y$ if $\pi(x) = \pi(y)$.
   (a) Verify that $\sim$ is an equivalence relation.
   (b) What are the equivalence classes of $\sim$?
   (c) Prove that there exists a bijection $\overline{\pi} : (X/\sim) \to S$.
3. Let X be a topological space, S a set, and $\pi : X \to S$ a surjective map. Give S the quotient topology. Let C be a subset of S. Prove that C is closed in S if and only if $\pi^{-1}(C)$ is closed in X.