

Math 131 - Problem Set 7, Part 1
Due Tuesday, Oct 23

From Munkres: 51.2, 51.3

1. Let X be a topological space. Consider the equivalence relation on X defined $x \sim y$ if there is a path in X from x to y . The equivalence classes are called *path components* of X . Define $\pi_0(X)$ to be the set of path components of X .
 - (a) If $f : P \rightarrow Y$ is continuous and P is path-connected, show that $f(P)$ is path-connected and thus contained in a single path component of Y .
 - (b) Show that if $f : X \rightarrow Y$ is a continuous function, there is an induced map on sets $\pi_0(f) : \pi_0(X) \rightarrow \pi_0(Y)$.
 - (c) Show that π_0 is a functor from the category of topological spaces (with continuous functions) to the category of sets.