Homework 4  
Due Wednesday, Feb. 24th  
Answers should be written in \LaTeX.

Assume that  

\[ p : E \to B \]

is a covering space and \( E \) is simply connected and locally path connected. Let \( b_0 \in B \) and \( e_0 \in p^{-1}(b_0) \subset E \) be basepoints.

1. Let \( e_1 \in p^{-1}(b_0) \). Show that there is a lift of the map of pairs  

\[ p : (E, e_1) \to (B, b_0). \]

That is show that there exists a map  

\[ p_1 : (E, e_1) \to (E, e_0) \]

with \( p \circ p_1 = p \) and \( p_1(e_1) = e_0 \).

2. Show that \( p_1 \) is a homeomorphism.

3. Let \( G \subset \text{homeo}(E) \) the set of all such homeomorphisms (as we let \( e_1 \) vary of all points in \( p^{-1}(b_0) \)). Show that \( G \) is a subgroup.

4. Show that the action of \( G \) on \( E \) is a deck action.

5. Show that the quotient space is homeomorphic to \( B \).