Corrected version. Please see that #2 had an error in the statement.

Redo #2 and turn it in on Monday April 5th.

1. Determine whether \( f: \mathbb{R} \rightarrow \mathbb{R} \) defined by \( f(x) = -x^3 \) is a permutation of \( \mathbb{R} \). Give a detailed proof of your answer.

2. Let \( A \) be a set. Let \( B \) be a subset of \( A \) and let \( b \) be one particular element of \( B \). Determine whether \( J = \{ \sigma \in S_A \mid \sigma(b) = b \} \) is sure to be a subgroup of \( S_A \) under the induced operation. Give a detailed proof of your answer.

3. Consider the following problem and then answer the questions that are asked. (Note: You are not being asked to give a proof.)

Let \( G \) a group. Prove that the permutations \( \sigma_a: G \rightarrow G \) where \( \sigma_a(x) = xa \) for \( a \in G \) and \( x \in G \) do form a group isomorphic to \( G \).

a) What conditions must \( \sigma_a \) satisfy in order to be a permutation.

b) Write set builder notation for the set of permutations the problem is asking you to prove is isomorphic to \( G \). Give the set the name \( J \).

b) What must be done in order to show \( J \) is a group?

c) Give a map (with an appropriate name) from \( G \) to \( J \) that will show \( G \) and \( J \) are isomorphic.