Math 739: Problem Set 2

Due on Friday, February 5

Be sure to prove all your answers.

1. p. 29, #1-7
2. p. 29, #1-9
3. p. 36, #2.8
4. p. 38, #2.10
5. Let S_n denote the set of permutations on n letters. Let each $\alpha \in S_n$ act on $S^1 \times S^1 \times \cdots\cdots S^1$ (n times) by permuting the entries according to the permutation α.
   (a) Show that this forms a *group action* of S_n on $S^1 \times \cdots \times S^1$.
   (b) Is this group action by diffeomorphisms? Prove your answer.
6. Consider the map
$$S^1 \times S^1 \to S^1$$
$$(t_1, t_2) \to t_1 t_2^{-1}.$$
   Is this a Lie group homomorphism? Is it smooth? What is its kernel?