M133 Exam 1

Choose 3 of the following 6 problems. Clearly indicate your choice. You may do more than 3 problems. If you do more than 3 problems, I may change which 3 problems count toward your grade on the in class part of exam 1 if this improves your grade.

1.) Describe a pre-atlas for RP^1 which generalizes to RP^n. Briefly describe how you can generalize your pre-atlas for RP^1 to RP^n

2.) Show that $f : RP^1 \to S^1$, $f([(cos(\theta), sin(\theta))]) = (cos(2\theta), sin(2\theta))$ is smooth (note: trig functions and inverse trig functions are smooth).

3.) Suppose $f : M \to N$ is smooth where M is an m-manifold and N is an n-manifold. Show that f is a continuous.

4.) We say that two pre-atlases on an m-manifold are *equivalent* if their union is an atlas. Show that this is an equivalence relation and that each equivalence class contains a unique complete atlas.

5a.) Define Lie group.
5b.) Show that $(\mathbf{Z}, +)$ is a Lie group.

6.) Define $f(S^1) \to S^1$, $f(e^{i\theta}) = e^{2i\theta}$. Calculate $df_{(1,0)}$.