Math 601 Spring 2008
Homework 1

Due: Friday January 25 in Martin Kerin's mailbox.

A portion of the homework will be graded and returned to you.

All space are assumed to be connected unless otherwise stated

(1) Show that the fundamental group of a Lie group G is abelian.

(2) Show that a topological space is simply connected iff any two paths with equal endpoints are homotopic.

(3) Show that every covering is a local homeomorphism and find a local homeomorphism that is not a covering (but is onto).

(4) Show that $f\colon \mathbb{C} \to \mathbb{C}\backslash\{0\}$ given by $f(z) = e^z$ is a covering.

(5) Let $f\colon X \to Z$, $g\colon X \to Y$ and $h\colon Y \to Z$ be continous maps such that $f = h \circ g$. Show that h is a covering if f and g are coverings.

(6) If M is a non-orientable manifold, show that there exists a connected two fold cover of M which is orientable.

(7) Show that the Klein bottle has a two fold cover which is orientable (describe it explicitly) , and another one which is non-orientable.