

ASSIGNMENT 4

Due date Monday 17th of November

- 1) Problem 6.16 of Lee, parts (a) and (c).
- 2) Problem 5.10 of Lee.
- 3) Consider G to be the set of all matrices of the form $\begin{pmatrix} a & b \\ 0 & 1 \end{pmatrix}$ where a is in the multiplicative group $\mathbb{R} \setminus \{0\}$, and b is in the additive group \mathbb{R} .

One way to think of G is as the group of affine transformations of \mathbb{R} , that is, diffeomorphisms of the form $x \mapsto ax + b$

- Show that G with matrix multiplication is a Lie group
 - Find an explicit formula for the left invariant vector field X on H where $X_e = \frac{\partial}{\partial a}|_e + \frac{\partial}{\partial b}|_e$
 - Do the same for the right invariant vector field with the same value of X_e . Is it the same as the answer to the previous question?
 - Identify G with \mathbb{R}^2 with the y axis removed. Sketch the vector fields obtained.
- 4) Problem 5.19 of Lee. Hint: Read pages 108-114