

Assignment-4

Due Date - 03-10-2023

(1) Problem-7 on page 46-47, chapter-1

(2) Let $M = G$ be a Lie group with a bi-invariant metric.

Show that $\exp_e: T_e G \longrightarrow G$ coincides with
 \mathfrak{g} - Lie algebra of G

the exponential map in Lie theory.

If $G = GL(n, \mathbb{R})$, then $T_{Id}(GL(n, \mathbb{R})) \cong M(n, \mathbb{R})$.

$$\exp_{Id}(A) = I + A + \frac{A^2}{2!} + \dots + \frac{A^k}{k!} + \dots$$

$A \in M(n, \mathbb{R})$.

(3) Problem-5, 7 on page 57, chapter-2.

(4) Let $f: A \subset \mathbb{R}^2 \longrightarrow M$ be a parametrized surface and let (s, t) be the usual co-ordinates of \mathbb{R}^2 . Let $V = V(s, t)$ be a vector field along f . For each (s, t) , show that.

$$\frac{D}{\partial t} \frac{D}{\partial s} V - \frac{D}{\partial s} \frac{D}{\partial t} V = R\left(\frac{\partial f}{\partial s}, \frac{\partial f}{\partial t}\right) V$$

(skip it)
(will be discussed in class)

(5) Problem-3, on page-80, chapter 3.

(6) Problem-1, 8, 9, 10 on page - 106-108, chapter-4

This assignment will be discussed in the class, by students.