

Third (and last) round of home-work exercises
(to be handed in before or on December 11)

Exercise 1.

Consider the projection:

$$\pi : SO(3) \rightarrow S^2, \quad A \mapsto \text{first row of } A.$$

- Show that it is a principal S^1 -bundle.
- Consider the representation $S^1 \rightarrow GL_2(\mathbb{R})$ by rotations:

$$\theta \mapsto \begin{pmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{pmatrix}$$

then show that $E(SO(3), \mathbb{R}^2)$ is isomorphic to TS^2 .

- Show that $SO(3)$ is an S^1 -structure (with $S^1 = SO(2)$). What is the geometric meaning?