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- (b) Two copies of \mathbb{R} with all non-zero points identified,
- (c) $\mathbb{R}P^n$,
- (d) $\mathbb{C}P^n$,
- (e) $T^n = \overbrace{S^1 \times \cdots \times S^1}^{n\text{-times}}$.

Problem 1.2 (Lee 2–10)

- (a) Show that the quotient map $\pi : \mathbb{C}^{n+1} \setminus \{0\} \rightarrow \mathbb{C}P^n$ is smooth.
- (b) Show that $\mathbb{C}P^1$ is diffeomorphic to S^2 .

Problem 1.3

For every pair of positive integers n and m , find infinitely many distinct nonconstant smooth maps from $\mathbb{C}P^n$ to $\mathbb{C}P^m$.

Problem 1.4 (Lee 2-11)

Let G be a connected Lie group, and let $U \subset G$ be any neighborhood of the identity. Show that every $g \in G$ can be written as a finite product of elements of U .

Problem 1.5 (Lee 3–1)

Suppose M and N are smooth manifolds with M connected, and $F : M \rightarrow N$ is a smooth map such that $F_* : T_p M \rightarrow T_{F(p)} N$ is the zero map for each $p \in M$. Show that F is a constant map.

Problem 1.6 (Lee 3–3)

If a nonempty smooth n -manifold is diffeomorphic to an m -manifold, prove that $n = m$.

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