

## Exercise sheet 1

1. Prove that a set map  $f : X \rightarrow Y$  is injective if and only if it has a left inverse.
2. Prove that a set map  $f : X \rightarrow Y$  is surjective if and only if it has a right inverse.
3. Prove that if  $f : X \rightarrow Y$  is a homeomorphism, then  $f_*$  is an isomorphism.
4. Prove that if  $r : X \rightarrow A$  is a retract, then  $r_*$  is surjective.
5. Consider the subset  $A = S^1 \times x_0$  of  $X = S^1 \times S^1$ . Prove that  $A$  is a retract of  $X$ .
6. Show that  $\mathbb{R}^n \setminus \{p\}$  retracts onto  $S^{n-1}$ .
7. Prove that  $\partial_n \circ \partial_{n+1} = 0$ .

**To be updated...**