# Exercise sheet 6

1. Prove that every map from a simply connected space to $S^1$ is null homotopic.
2. Prove that every map from $\mathbb{RP}^2$ to $S^1$ is null homotopic.
3. Prove that if $X$ has a simply connected cover, then given any point in $x \in X$, there exists a neighourhood $U$ of $x$ so that $i_* : \pi_1(U, x) \to \pi_1(X, x)$ is trivial (here, $i_*$ is the homomorphism induced by the inclusion map $i : U \to X$).
4. Prove that any two universal coverings are equivalent.
5. Prove that the "Hawaiian earring" is not semi-locally simply connected.
6. Find all path-connected coverings of $S^1$ and $S^1 \times S^1$ up to equivalence.