Reading: Hatcher §1.2 and 1.3.

Exercise 1. Hatcher §1.2, Exercises 6, 7. Do, but do not hand in 14 and 22.

Exercise 2. If G is a non-abelian group, then its abelianization is $G^{ab} := G/[G,G]$, where $[G,G]$ is the subgroup generated by all commutators $[g,h] = ghg^{-1}h^{-1}$, $g,h \in G$.

Prove that the fundamental group of any knot complement must have abelianization isomorphic to $\mathbb{Z}$. Recall that a knot is an embedded circle in $\mathbb{R}^3$.

Exercise 3. Compute the fundamental group of $\mathbb{C}^2 \setminus \{\ell_1 \cup \ell_2 \cup \ell_3\}$, where ℓ_i are three different lines through the origin.

Exercise 4. Let $X = S^2 \times S^2$ and let $Z \subset X$ be the image of $S^1 \times S^1$ under the embedding $j \times j$, where j is the inclusion of a great circle $S^1 \subset S^2$. Compute the fundamental group of $X \setminus Z$, using the van Kampen theorem for fundamental groupoids.

Exercise 5. Hatcher §1.3 Exercises 10, 12, 14. Do but do not hand in 27.