

**ÜBUNGSAUFGABEN ZU
PROSEMINAR ALGEBRAISCHE TOPOLOGIE**

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Exercise 13. Let G_α be groups $\alpha \in A$. Show that

$$(*_\alpha G_\alpha)^{\text{ab}} \cong \bigoplus_{\alpha \in A} G_\alpha^{\text{ab}}.$$

Here $H^{\text{ab}} := H/[H, H]$ denotes the abelization of a group H .

Exercise 14. Use the theorem of Seifert–van Kampen to show that the fundamental group of $X := (S^1 \times S^1)/(\{1\} \times S^1)$ is isomorphic to \mathbb{Z} . Specify a loop in X which represents a generator of $\pi_1(X)$.