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4. Algebraic Geometry

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Topological structure of spaces of holomorphic morphisms

A holomorphic morphism is a triple $(\widetilde{P}, f, P)$, where $\widetilde{P}, P$ are compact Riemann surfaces and $f : \widetilde{P} \to P$ is a holomorphic map. Here $(\widetilde{P}_1, f_1, P_1) = (\widetilde{P}_2, f_2, P_2)$ if there exist biholomorphic maps $\widetilde{\varphi} : \widetilde{P}_1 \to \widetilde{P}_2$ and $\varphi : P_1 \to P_2$ such that $\varphi f_1 = f_2 \widetilde{\varphi}$. Morphisms $(\widetilde{P}_1, f_1, P_1)$ and $(\widetilde{P}_2, f_2, P_2)$ are topologically equivalent if there exist homeomorphisms $\widetilde{\varphi} : \widetilde{P}_1 \to \widetilde{P}_2$ and $\varphi : P_1 \to P_2$ such that $\varphi f_1 = f_2 \widetilde{\varphi}$.

Theorem. Let $(\widetilde{P}_0, f_0, P_0)$ be a holomorphic morphism such that $2g + n > 2$, where g is the genus of P and n is the number of critical values of f_0. Consider the set H of all holomorphic morphisms $(\widetilde{P}, f, P)$ that are topologically equivalent to $(\widetilde{P}_0, f_0, P_0)$. Then H is homeomorphic to $\mathbb{R}^{6g+2n-6}/\mathrm{Mod}$, where Mod is a discrete group.