Braid Group Action on Homology and its applications

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Given a branched cover of the $\mathbb{CP}^1$ with a standard description of permutation representation through $\sigma_1 \cdots \sigma_r \in S_n$ such that the genus is 1 we give a computational criteria to answer a question when these branched covers are of full moduli dimension.

Theorem 1. *Given a cover represented by the permutation representation as above form a moduli space of such. If there is an element of the fundamental group of such space (which is the subgroup of the braid group) acts on the homology basis of such cover with an element of an infinite order then the cover is of the full moduli dimension (i.e. a generic curve of genus* 1 *carries a function with such permutation representation.)*

The second application of these ideas is to compute fundamental groups of complex surfaces that are covers of $(CP^2 - D_2)/SL_2(\mathbb{C})$.