1154-14-1488 **Farkhod Eshmatov**, **Rustam Hamdam**, **Jacob Kesten*** (jgk3@rice.edu), **Samuel Mathers** and **Zafar Normatov**. *Transitivity on the Calogero-Moser Variety C_2.*

We consider the Calogero-Moser Varieties C_n, defined as orbit spaces of the set $\{(X,Y) \in \mathbb{C}^{n\times n} \times \mathbb{C}^{n\times n} : \text{Rank}[XY - YX + I_n] \leq 1\}$ under the group action of $GL_n(\mathbb{C})$. These emerge through the study of $n-$particle systems in $\mathbb{R}$ evolving in time. Since Calogero conjectured such systems are solvable and proved so using matrices of the above form, these matrix sets have been studied in detail, where it was shown that the elements of the space are expressible as polynomials in matrix traces. In our project, we consider the variety of dimension four, which we proved can be expressed as the quotient $C_2 := \mathbb{C}[x_1, ..., x_5]/(x_4^2 - x_3x_5 - 1)$. We then define an action by the group of automorphisms of the free algebra $\mathbb{C}\langle x, y\rangle$ on C_2. It was proven by Berest, et al. that this group action is 2-transitive, and conjecture that it is infinitely transitive, which is what we attempt to prove. We develop a method that allows us to prove up to 7-transitivity, and which should be generalizable to infinite-transitivity. Specifically, barring the proof of a technical lemma, we indeed show that the action is infinitely transitive.

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