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Modular Invariant Theory of the Cyclic Group via Classical Invariant Theory

Let C_p denote the cyclic group of prime order p. An important problem in modern invariant theory is to compute (generators for) the ring of invariants of a C_p representation over a field F of characteristic p. Up until now, this has only been done for a few representations.

The central problem in invariant theory in the nineteenth century and early twentieth century was to compute (generators for) the ring of invariants of a complex representation of $\mathrm{SL}_2(C)$. Up to one third of the algebra papers published in the 1880's concerned this problem.

In this talk I will describe a surprising connection between these two problems and my recent result which demonstrates that the two problems are equivalent. Using this we are able to use classical results to give generators for many new modular representations of C_p.