

DISSERTATION
DEFENSE

*Combinatorial Objects at the Interface of q -series and Modular
Forms*

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Abstract: In this work, the author proves various results related to q -series and modular forms by employing a broad range of tools from analytic number theory, combinatorics, the theory of modular forms, and algebraic number theory. More specifically, the circle method, the connection between modular forms and elliptic curves, continued fractions, period polynomials, and several other tools from the theory of modular forms are used here. These allow the author to prove a number of results related to q -series and partition functions, modular forms, period polynomials, and certain quadratic polynomials of a fixed discriminant. This includes a proof of the Alder-Andrews conjecture on certain restricted partition functions, and a resolution of a speculation of Don Zagier regarding the Eichler integrals of a distinguished class of modular forms.

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