SEMINARIO

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Looking for a new version of Gordon's identities and differential ideals

Abstract: A partition (of length ℓ) of a positive integer n is a sequence $\Lambda : (\lambda_1 \geq \lambda_2 \geq \cdots \geq \lambda_\ell)$ of positive integers λ_i, for $1 \leq i \leq n$, such that

$$\lambda_1 + \cdots + \lambda_n = n.$$

The integers λ_i are called the parts of the partition Λ.

The partitions identities, which stipulate that the number of the partitions of an integer n satisfying a certain condition A is equal to the number of the partitions of n satisfying another condition B, play an important role in many areas like number theory, combinatorics, Lie theory, particle physics and statistical mechanics. One family of important partitions identities is called Gordon's identities. These state the following. Given integers $r \geq 2$ and $1 \leq i \leq r$, let $B_{r,i}(n)$ denote the number of partitions of n of the form $(b_1, \ldots, b_s)$, where $b_j - b_{j+r-1} \geq 2$ and at most $i-1$ of the b_j are equal to 1. Let $A_{r,i}(n)$ denote the number of partitions of n into parts $\not\equiv 0, \pm i$(mod.$2r+1$). Then $A_{r,i}(n) = B_{r,i}(n)$ for all integer n.

Using differential ideals, we can conjecture a family of partition identities related to Gordon's identities. We prove this conjecture for two identities among this family.

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