Quantum Gravity Via Expansion−Contraction 9.0: Surprising Relationships of Riccati y−y^2

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- *From*: "OsherD" <mdoctorow@xxxxxxxxxxx>
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From Osher Doctorow mdoctorow@xxxxxxxxxxx

The Riccati Differential equation:

1) dy/dt = A(t) + B(t)y + C(t)y^2

has some surprising relationships of y and y^2 across mathematics and physics based on or related to the method of splitting series into sums of y^2 and y series (or x^2 and x series in other notation).

The most explicit example of this that I have found so far is O. Costin (Rutgers U. and U. Chicago), "Topological construction of transseries and introduction to generalized Borel summability," math.CA/0608309 v1 13 Aug 2006.

There are at least two keyword phrases or combinations to find this type of research on arXiv and/or Front for the Mathematics arXiv, namely "divergent solutions" and "Borel sum". The first yields 12 papers from 2002 through 2006 including two of Costin's papers in 2006, while the second yields 24 papers from 1994 through 2006 including two of Costin's papers in 2006.

Referring to the first Costin paper mentioned above, a surprising fact mentioned on pages 1 and 2 is that spaces of transseries were introduced approximately simultaneously in analysis, logic, number theory, and applied mathematics.

Examining the 12 + 24 papers referred to above, one paper is on the second Painleve hierarchy which relates to Riccati Differential equations (2002), and topics as diverse as matrix integrals and resonant nonlinear wave equations are covered. Other topics include nonlinear exactly solvable and integrable systems (NLIN.SI in the arXiv labels), complex variables, functional analysis, classical analysis and ODEs (CA in the Front for the Mathematics ArXiv symbols), dynamical systems, geometric topology, quantum algebra, analysis of PDEs (AP), algebraic topology (AT), representation theory (RT).

Osher Doctorow

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