A Quantum Leap: Developing Quantum Semi-Structured Complex Numbers to Solve the "Division by Zero" Problem

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Abstract : The problem of division by zero can be stated as: "what is the value of 0 x 1/0?" This expression has been considered undefined by mathematicians because it can have two equally valid solutions either 0 or 1. Recently semi-structured complex number set was invented to solve "division by zero". However, whilst the number set had some merits it was considered to have a poor theoretical foundation and did not provide a quality solution to "division by zero". Moreover, the set lacked consistency in simple algebraic calculations producing contradictory results when dividing by zero. To overcome these issues this research starts by treating the expression " 0 x 1/0" as a quantum mechanical system that produces two tangled results 0 and 1. Dirac Notation (a tool from quantum mechanics) was then used to redefine the unstructured unit p in semi-structured complex numbers so that p represents the superposition of two results (0 and 1) and collapses into a single value when used in algebraic expressions. In the process, this paper describes a new number set called Quantum Semi-structured Complex Numbers that provides a valid solution to the problem of "division by zero". This research shows that this new set (1) forms a "Field", (2) can produce consistent results when solving division by zero problems, (3) can be used to accurately describe systems whose mathematical descriptions involve division by zero. This research served to provide a firm foundation for Quantum Semi-structured Complex Numbers and support their practical use.

Keywords : division by zero, semi-structured complex numbers, quantum mechanics, Hilbert space, Euclidean space

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