

Factoring Partial Differential Operators

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It has been known for a long time that an ordinary linear differential operator can be factored into a product of irreducible ordinary linear operators and that this factorization is unique up to a certain equivalence. This result follows from a Jordan-Hoelder type theorem for certain modules over the ring of ordinary differential operators.

A consequence of the above result is that the number of irreducible factors of an operator and their orders are unique. This is no longer true for partial differential operators and we discuss several examples to show in which ways this can fail. Instead of looking for factors one can consider subspaces of the solution space that are again defined by the vanishing of linear operators. I will discuss a result that states that there exists a finite tower of such subspaces where the successive quotients are “simple” in a certain sense and show that these quotients are unique up to a certain kind of equivalence. This is joint work with Phyllis Cassidy.