



Mathematical Physics

# Nonlinear self-adjointness and conservation laws

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The general concept of nonlinear self-adjointness of differential equations is introduced. It includes the linear self-adjointness as a particular case. Moreover, it embraces the strict self-adjointness and quasi self-adjointness introduced earlier by the author. It is shown that the equations possessing the nonlinear self-adjointness can be written equivalently in a strictly self-adjoint form by using appropriate multipliers. All linear equations possess the property of nonlinear self-adjointness, and hence can be rewritten in a nonlinear strictly self-adjoint. For example, the heat equation  $u_t - \Delta u = 0$  becomes strictly self-adjoint after multiplying by  $u^{-1}$ . Conservation laws associated with symmetries can be constructed for all differential equations and systems having the property of nonlinear self-adjointness.

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