Abstract. In this paper we develop a multivariate setting which includes natural partial differential analogs of the well-known first-order normal system of ordinary differential equations and the nth order normal differential equation. The multivariate counterparts of both of the above examples are overdetermined normal systems of PDEs: a first-order one, which is the well-known Pfaff system of PDEs and a higher order (HO) system of PDEs, with a single unknown function, which was introduced by the authors (see Hakopian and Tonoyan, 1998b and 2002b). We generalize the well-known results, including the connection of equivalence which is rather unexpected for the theory of PDEs. Among other generalized results are the method of variation of constants, fundamental set of solutions, Wronskian, Liouville's formula. The equivalence, in view of the existence and uniqueness result of the Pfaff system, yields a similar result for the HO system.

Also the linear constant coefficient cases and an algebraic system, arising from the multivariate characteristic polynomials, are studied. This algebraic system is a multivariate counterpart of the univariate polynomial equation. Interestingly a multivariate analog of the fundamental theorem of algebra (FTA) holds for the algebraic system (see Hakopian and Tonoyan, 1998a, 2000 and 2002b, and Hakopian, 2003a), which allows us to find a fundamental set of solutions of the HO systems of PDEs, similarly to the univariate case.