Equivalence Classes and Symmetries of Abel's Equation

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A scheme for solving Abel's equation is described that is based on a certain infinite group of point transformations, the so-called *structure invariance* group, and a normal form wrt. this group, the so-called *rational normal form (RNF)*. The key objects in this scheme are the *equivalence classes* of equations wrt. this group. They are identified by means of an *absolute invariant*. The equations of an equivalence class may allow one or two point symmetries that are applied for the solution procedure. If an equation does not have a symmetry, membership in an equivalence class may be decided by functional decomposition in the coefficient field of the given equation. Based on this scheme a solution algorithm is developed that generates most of the closed form solutions described in the literature as a consequence of non-trivial symmetries. It is suggested that similar schemes may be developed for other classes of equations.