An Euler-Cauchy Surprise

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Abstract

The Euler-Cauchy equation is typically the first higher order non-constant coefficient equation encountered by students in an undergraduate ordinary differential equations (ODE) course. As such, the method of undetermined coefficients, which can only be applied to nonhomogeneous constant coefficient differential equations with certain right-hand side functions, cannot be applied to nonhomogeneous Euler-Cauchy equations. However, in giving exams to my ODE classes, I discovered that, for certain Euler-Cauchy problems, the method of undetermined coefficients does, in fact, give the correct solution. This talk examines under what conditions we can expect the method of undetermined coefficients to yield the correct particular solution for a nonhomogeneous Euler-Cauchy equation.