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## Bounds for Asymptote Singularities of Certain Nonlinear Differential Equations

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**Abstract:**

In this paper, bounds are obtained for the location of vertical asymptotes and other types of singularities of solutions to certain nonlinear differential equations. We consider several different families of nonlinear differential equations, but the main focus is on the second order initial value problem (IVP) of generalized superlinear Emden-Fowler type

$$y''(x) = p(x)[y(x)]^\eta, \quad y(x_0) = A, \quad y'(x_0) = B, \quad \eta > 1$$

A general method using bounded operators is developed to obtain some of the bounds derived in this paper. This method allows one to obtain lower bounds for the cases  $A = 0$  and  $A < 0$  under certain conditions, which are not handled by previously discussed bounds in the literature. We also make several small corrections to equations appearing in previous works. Enough numerical examples are given to compare the bounds, since no bound is uniformly better than the other bounds. In these comparisons, we also consider the bounds of Eliason [11] and Bobisud [5]. In addition, we indicate how to improve and generalize the bounds of these two authors.



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