

On the existence of nonoscillatory phase functions for second order differential equations

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We will discuss new techniques for the solution of second order linear differential equations in the highly-oscillatory regime. These techniques are based on the recent observation that essentially all second order linear differential equations admit nonoscillatory phase functions. In addition, we describe numerical experiments which illustrate important implications of this fact. For example, that many special functions of great interest — such as the Bessel functions J_ν and Y_ν — can be evaluated accurately using a number of operations which is $O(1)$ in the order ν .