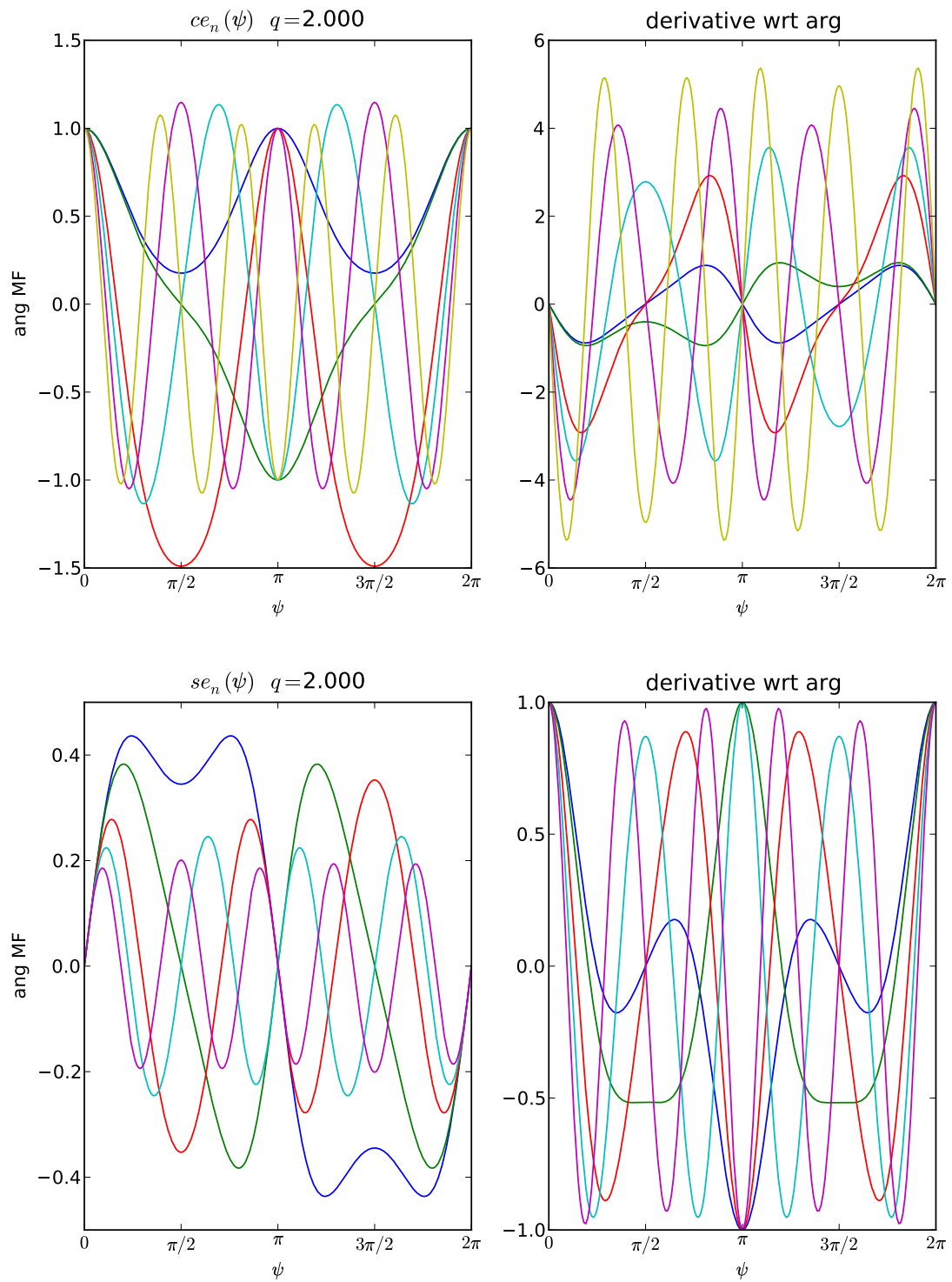
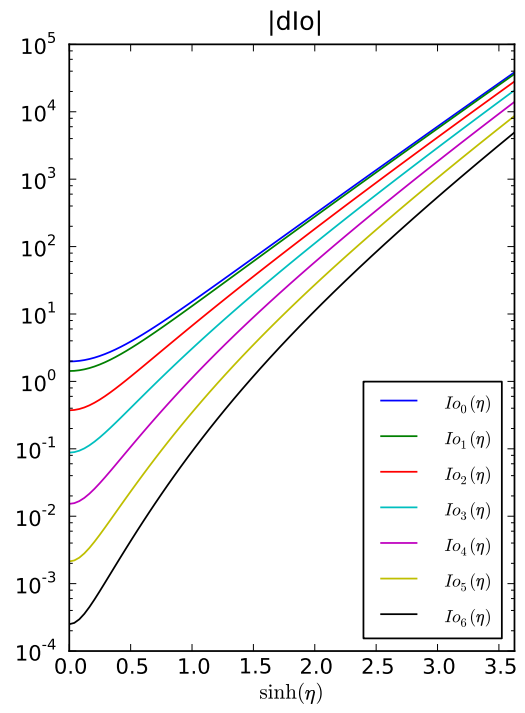
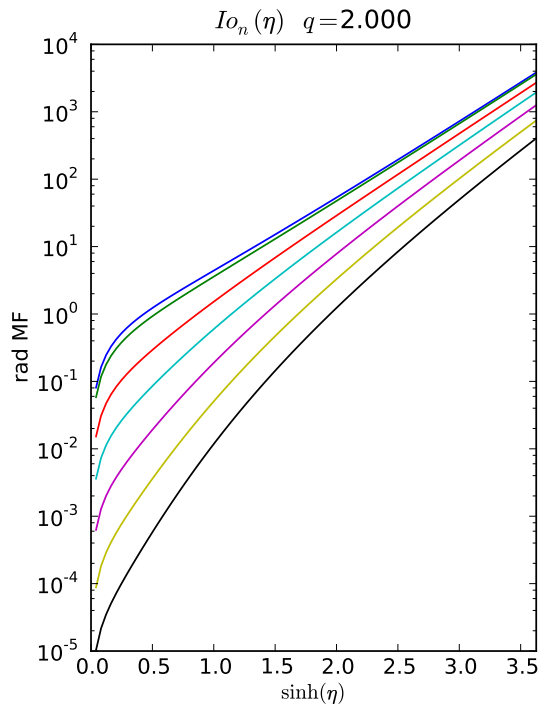
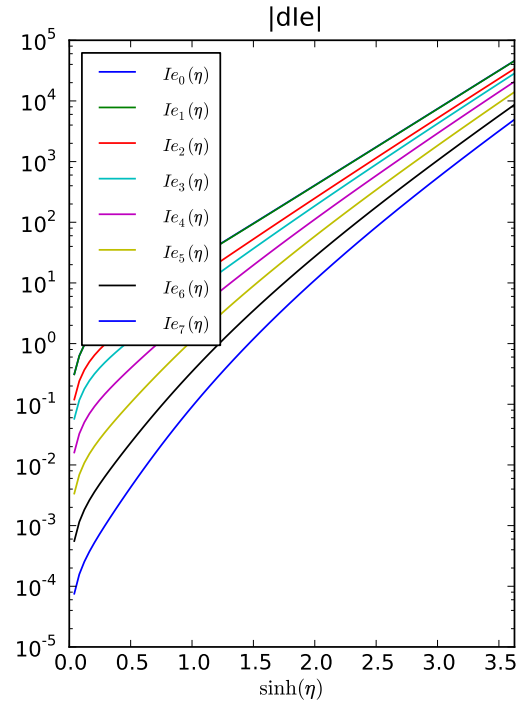
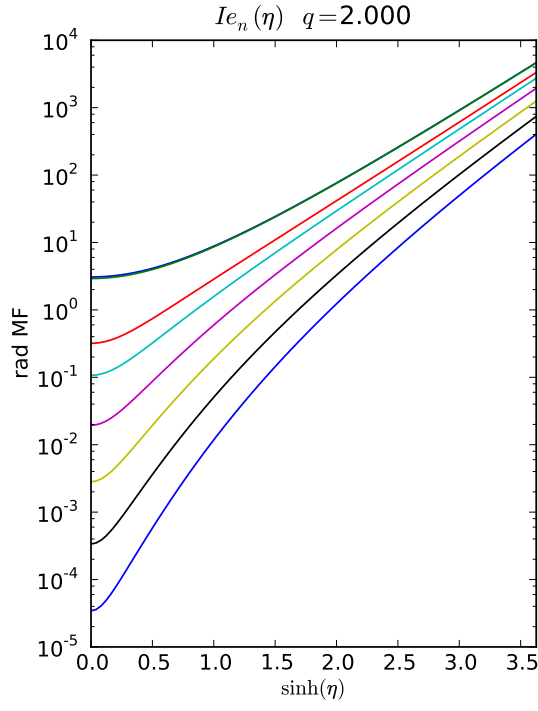
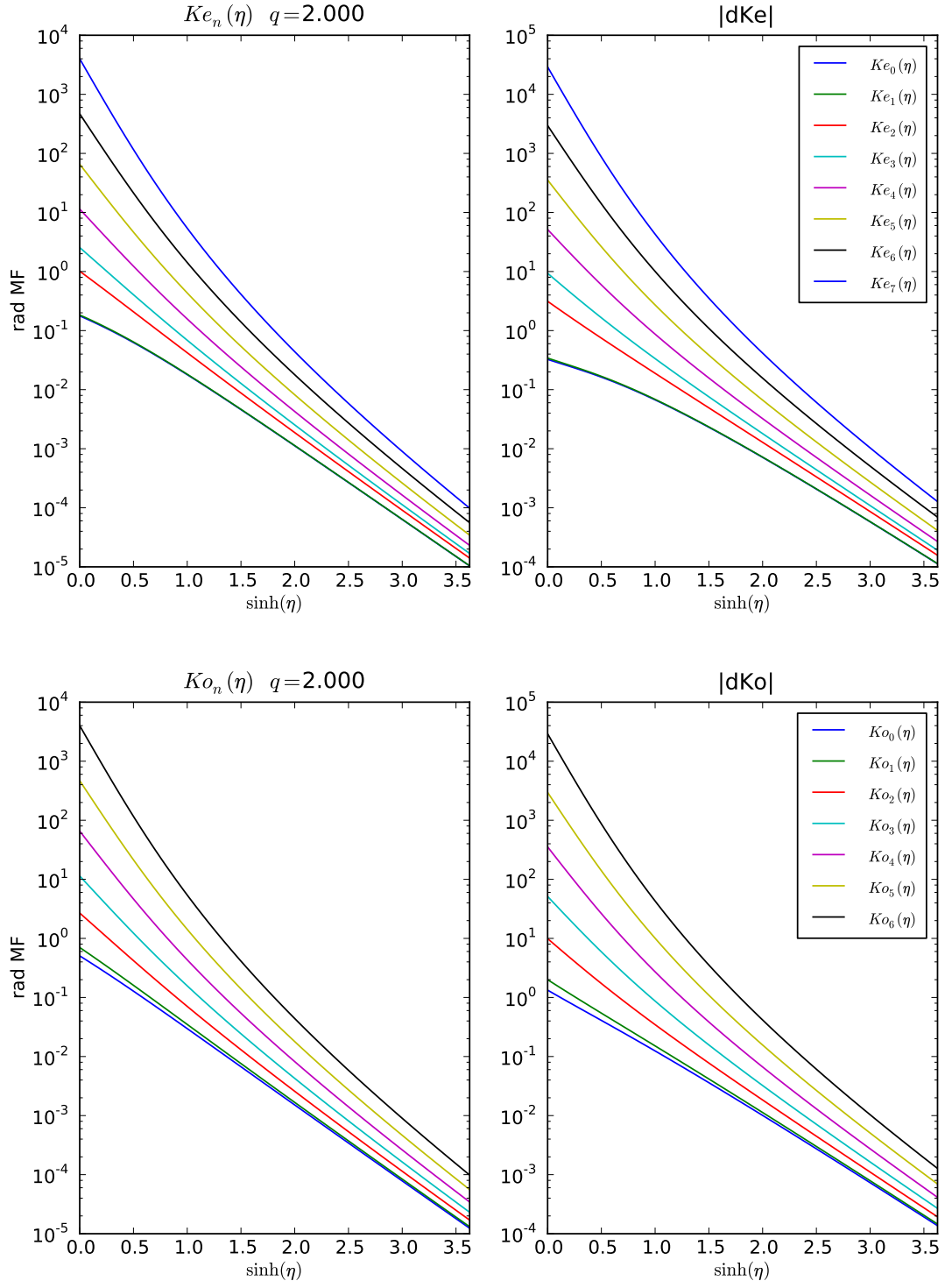


1 Plots of modified Mathieu functions and Derivatives

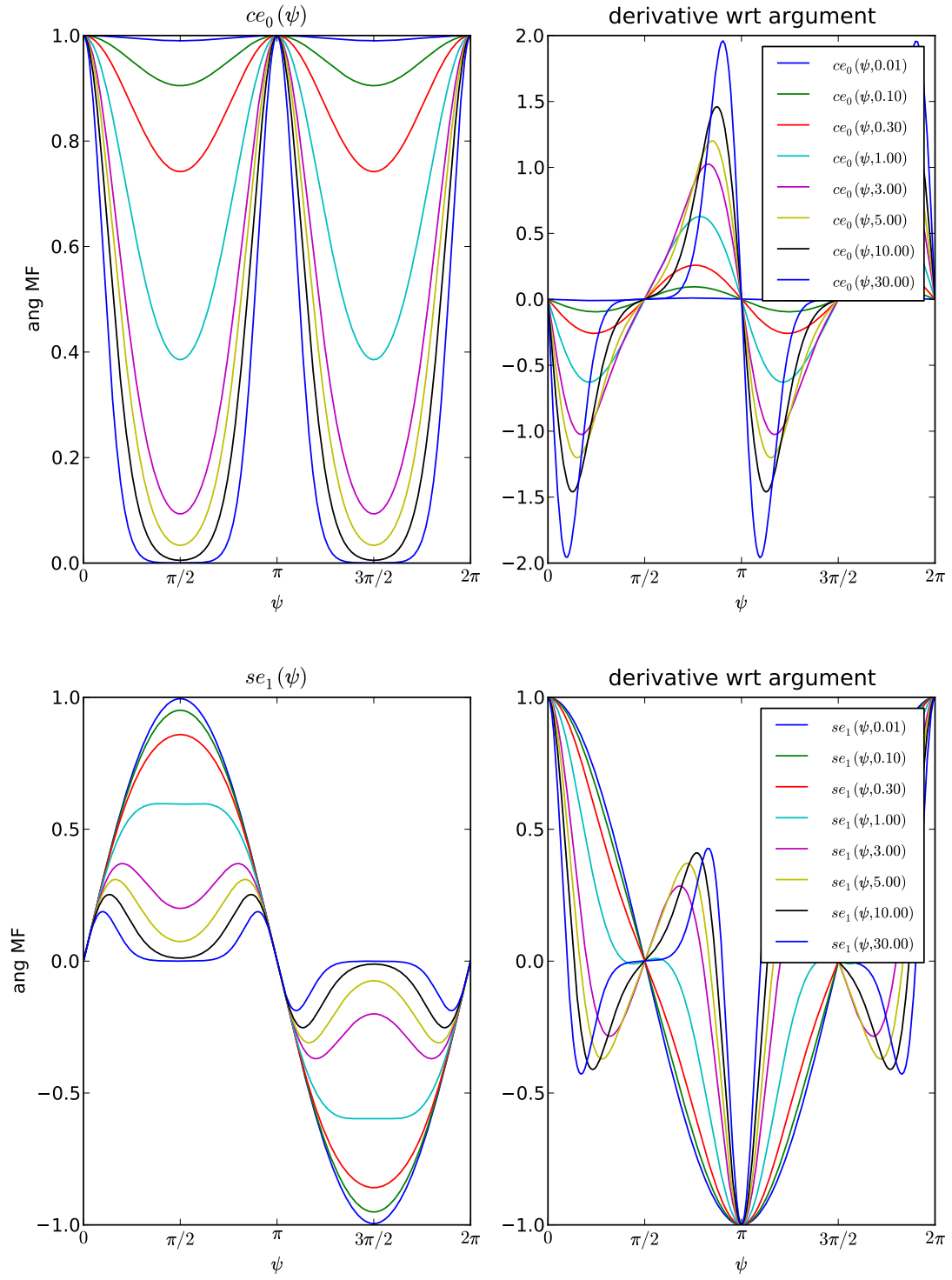
1.1 Constant real q , variable order

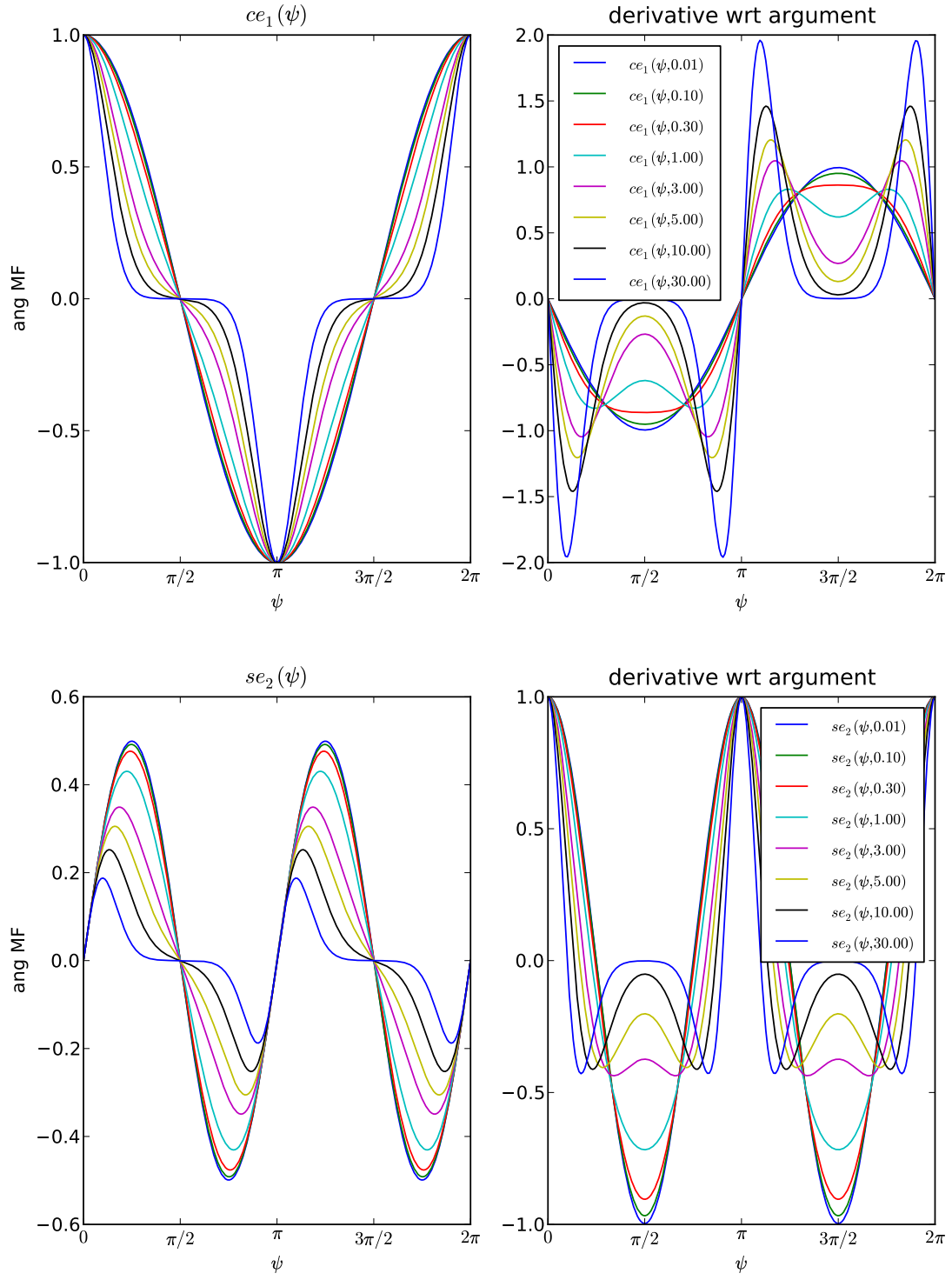


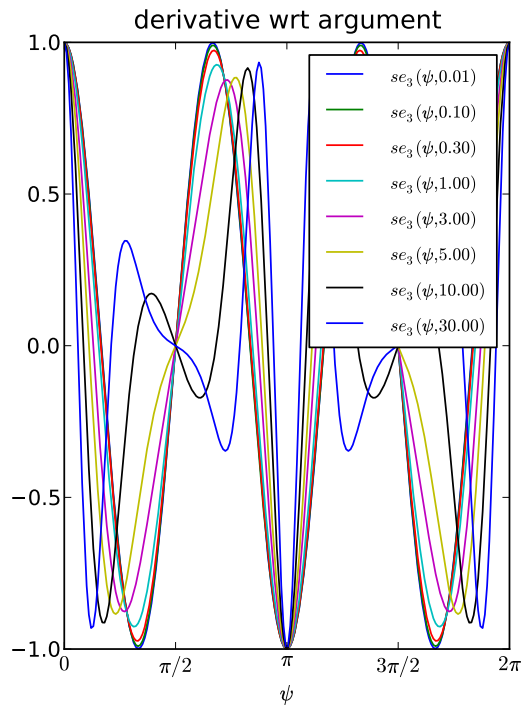
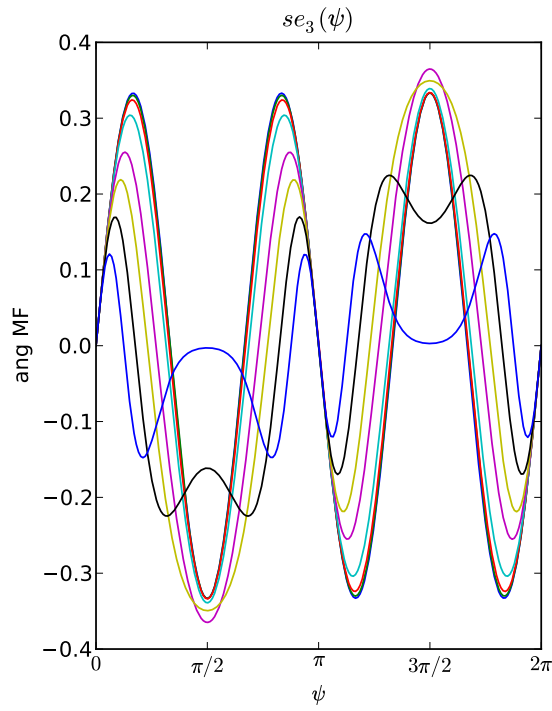
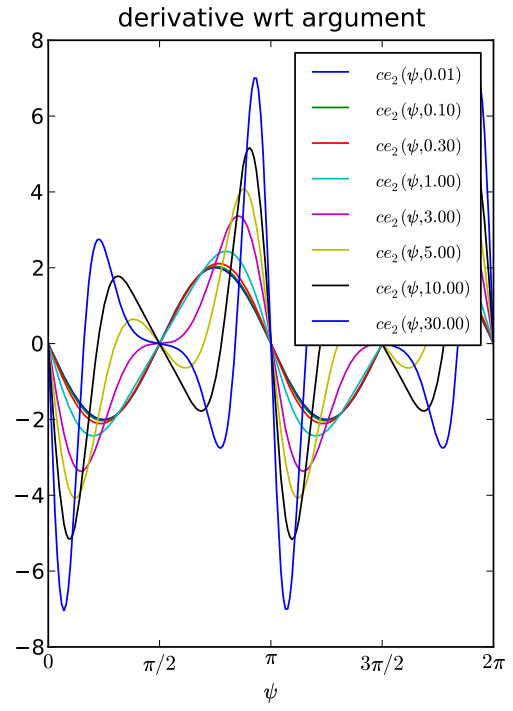
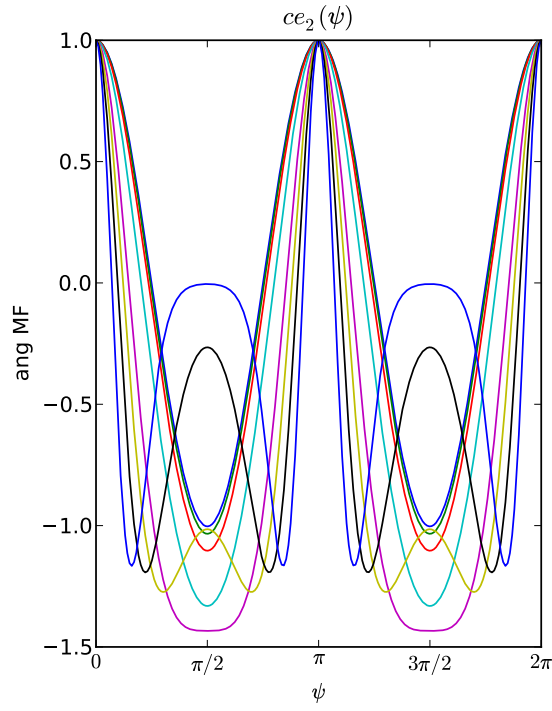


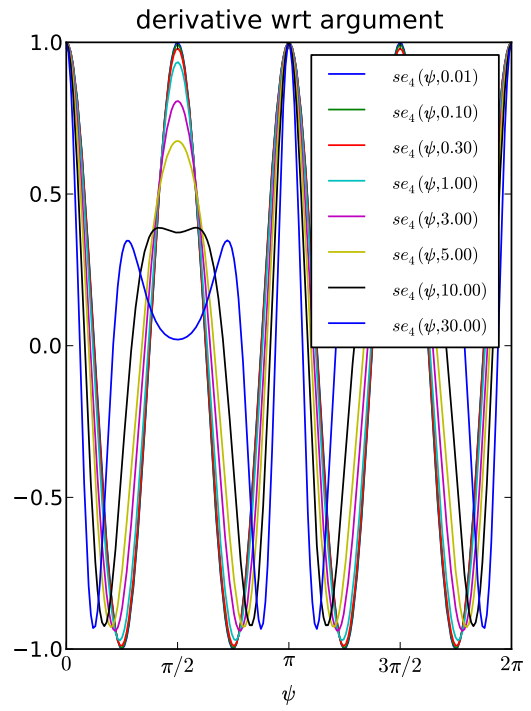
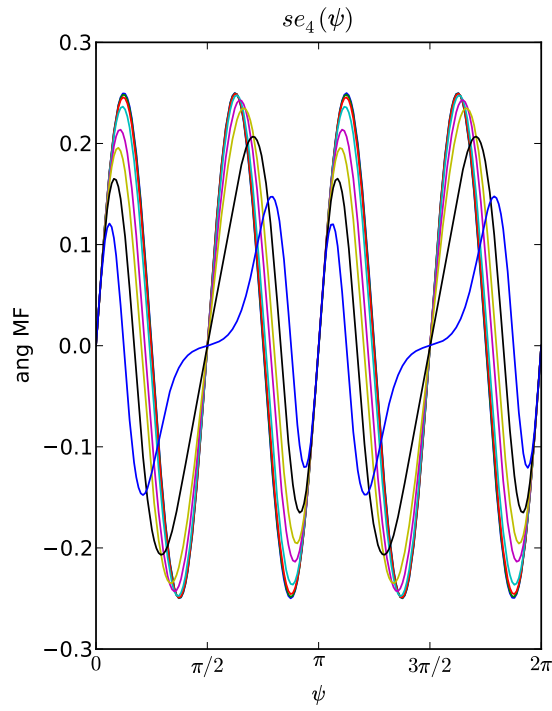
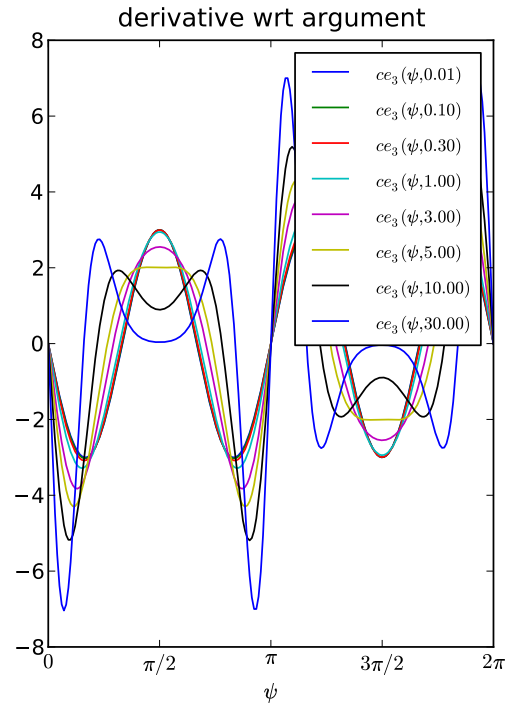
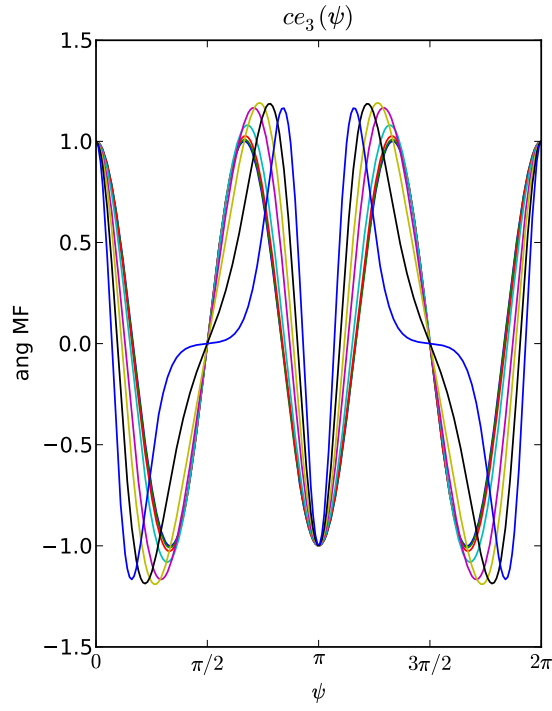


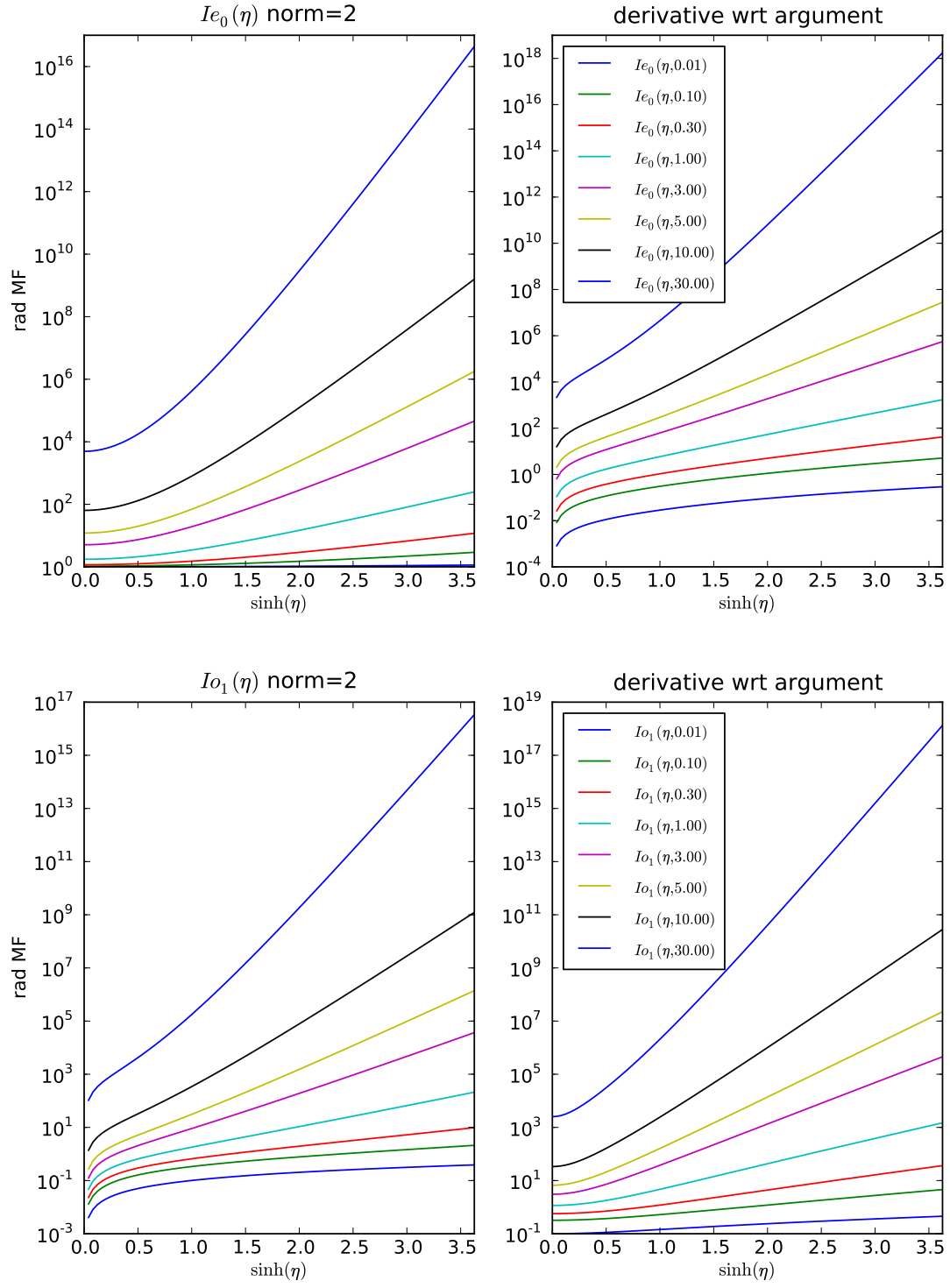
1.2 Constant order, variable real q

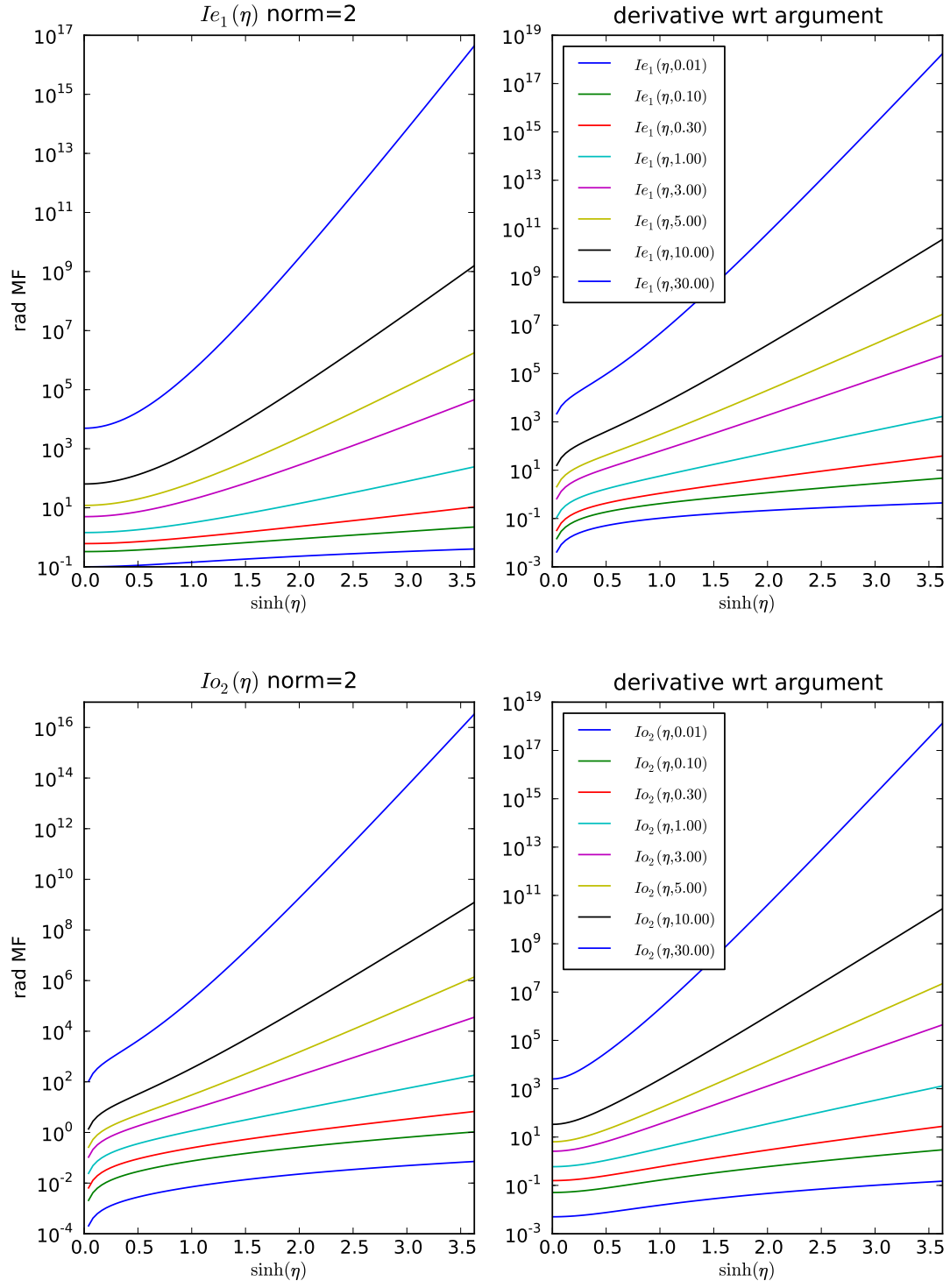


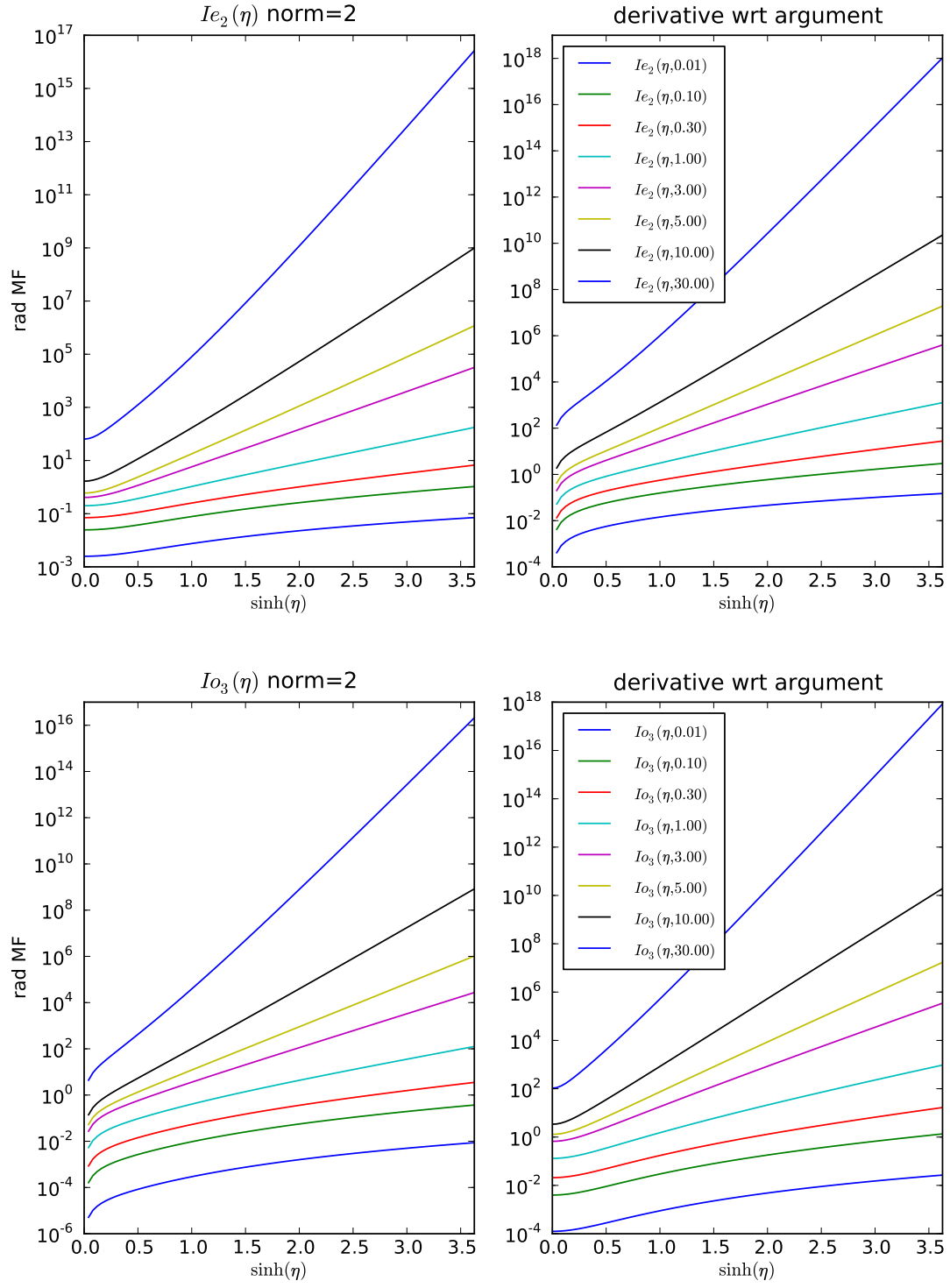


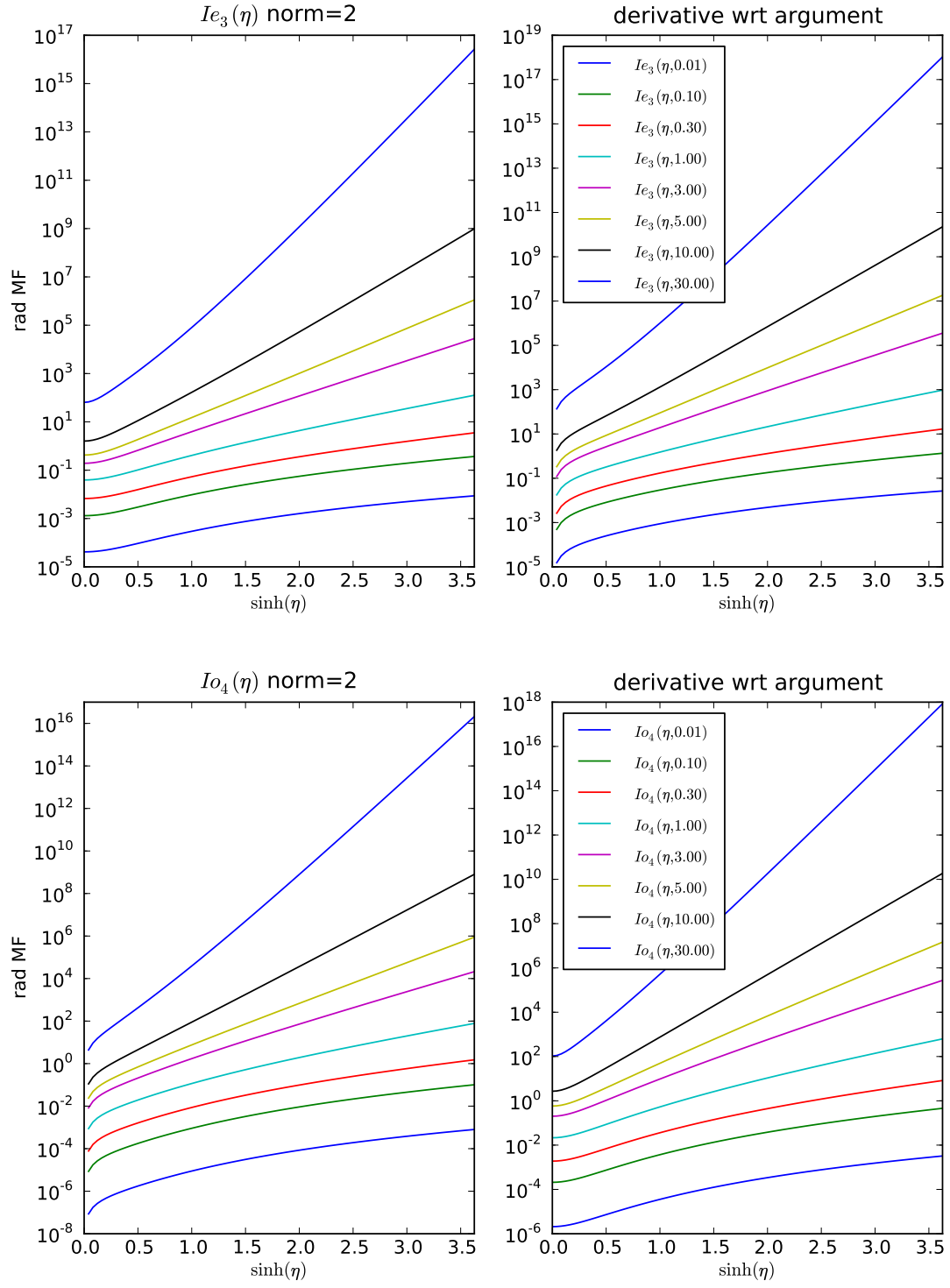


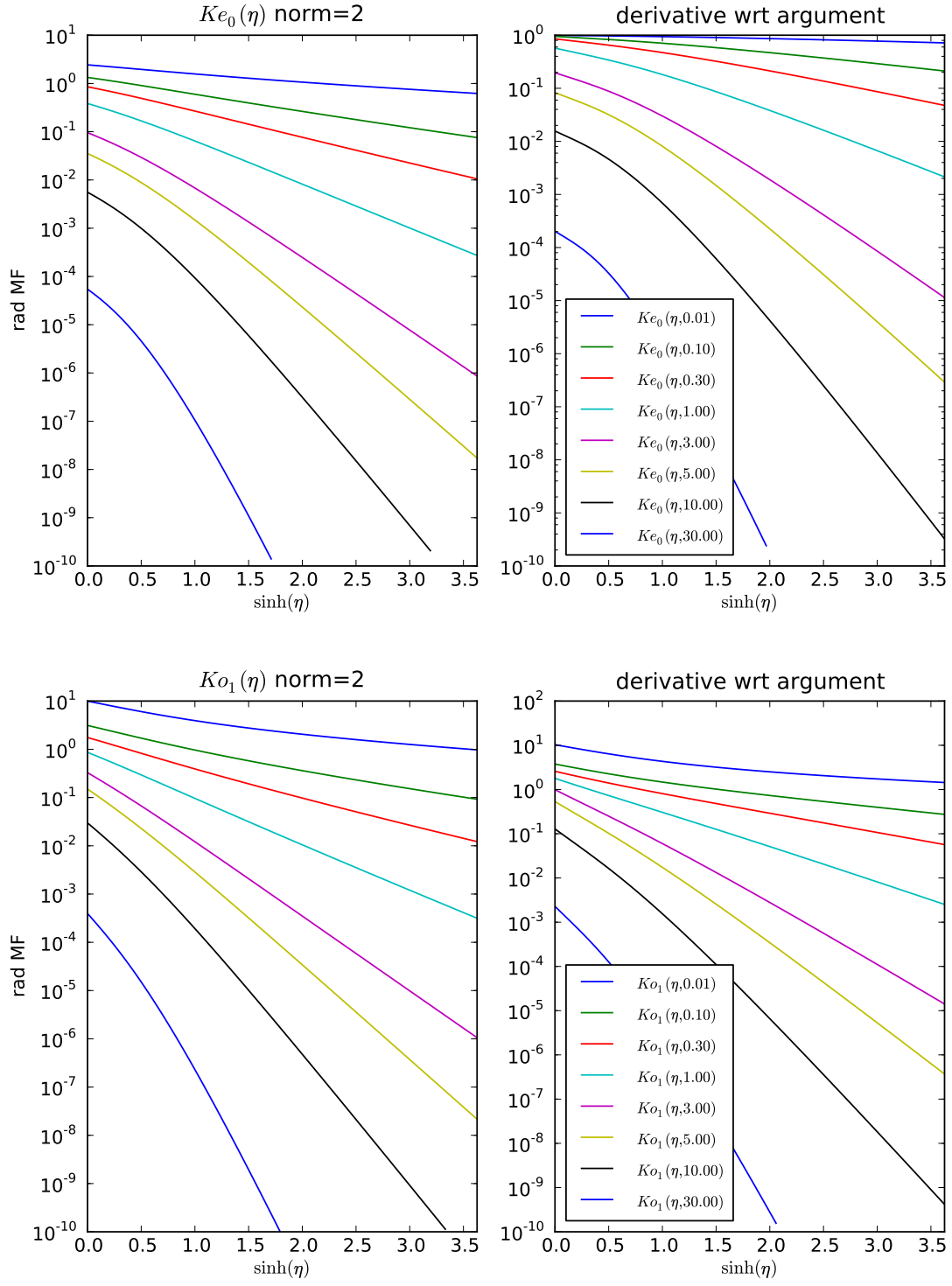


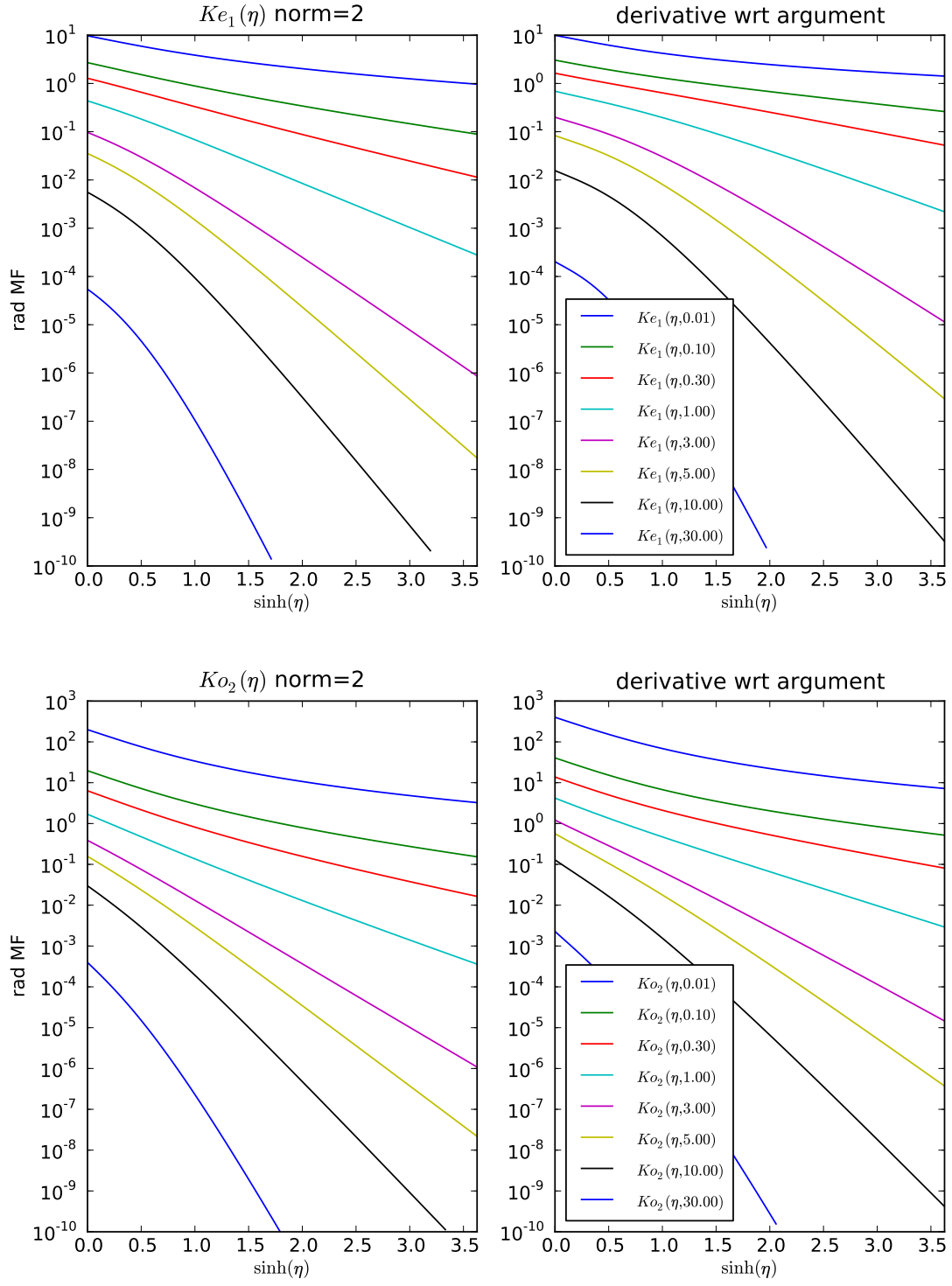


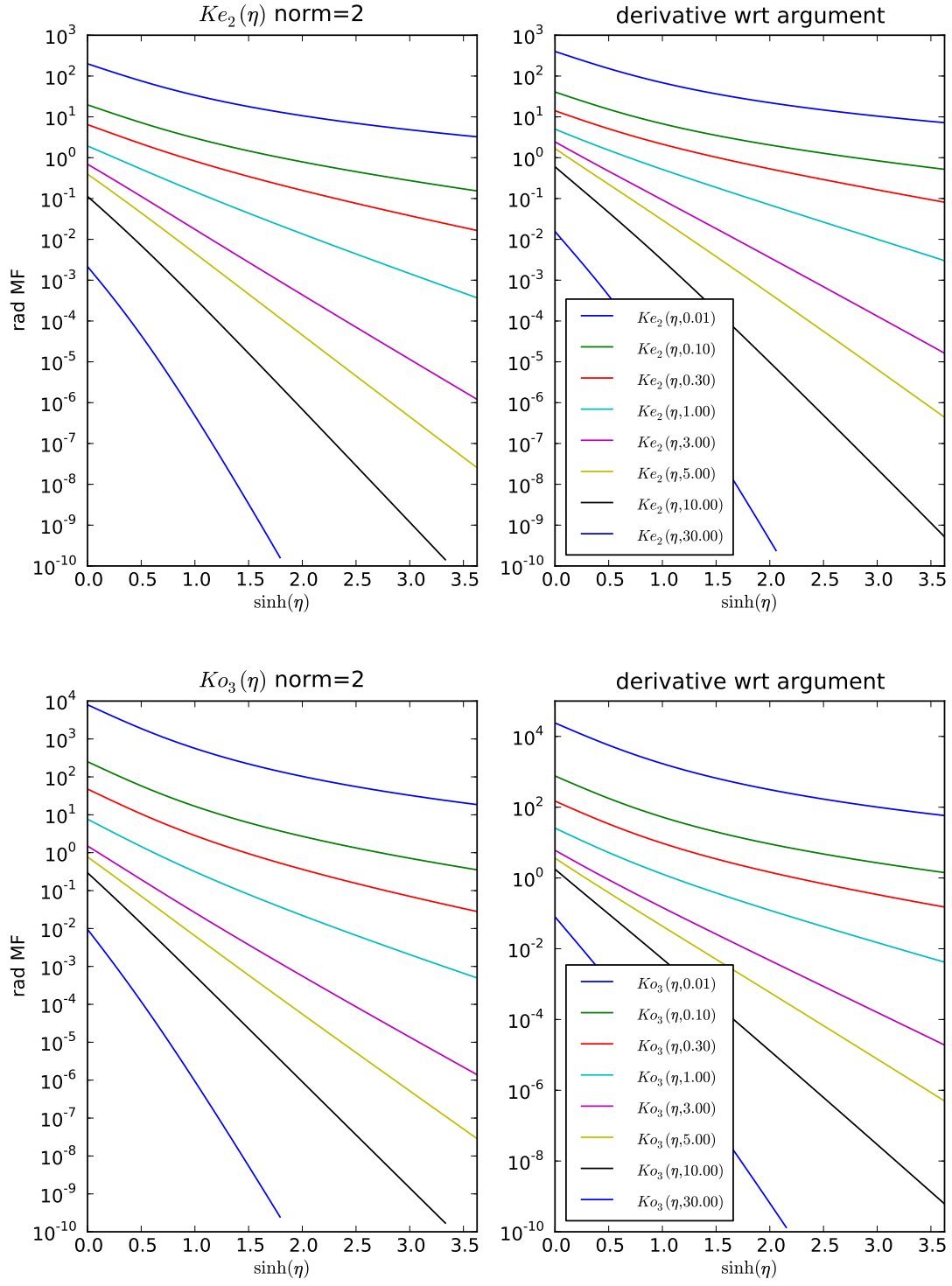


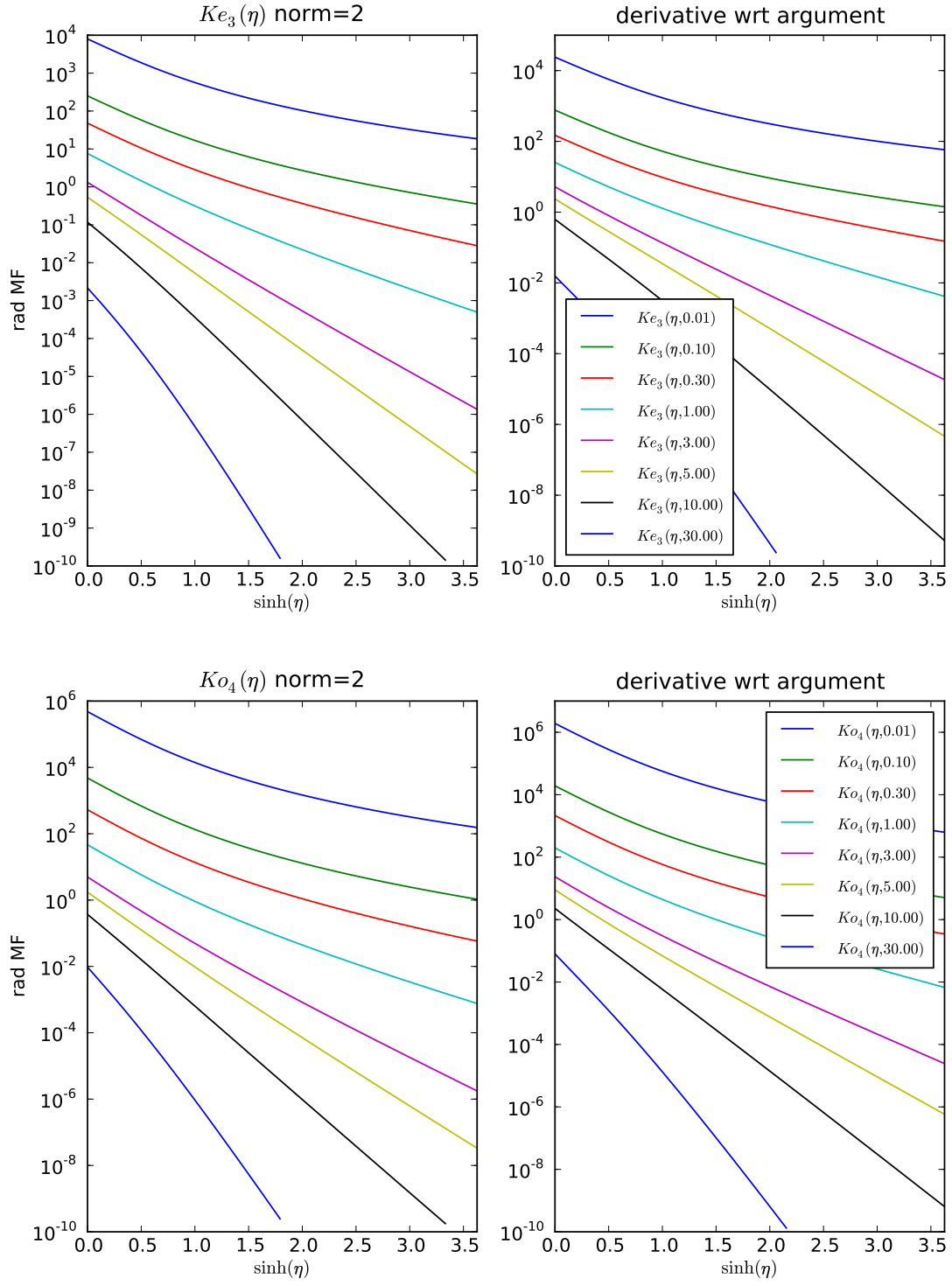






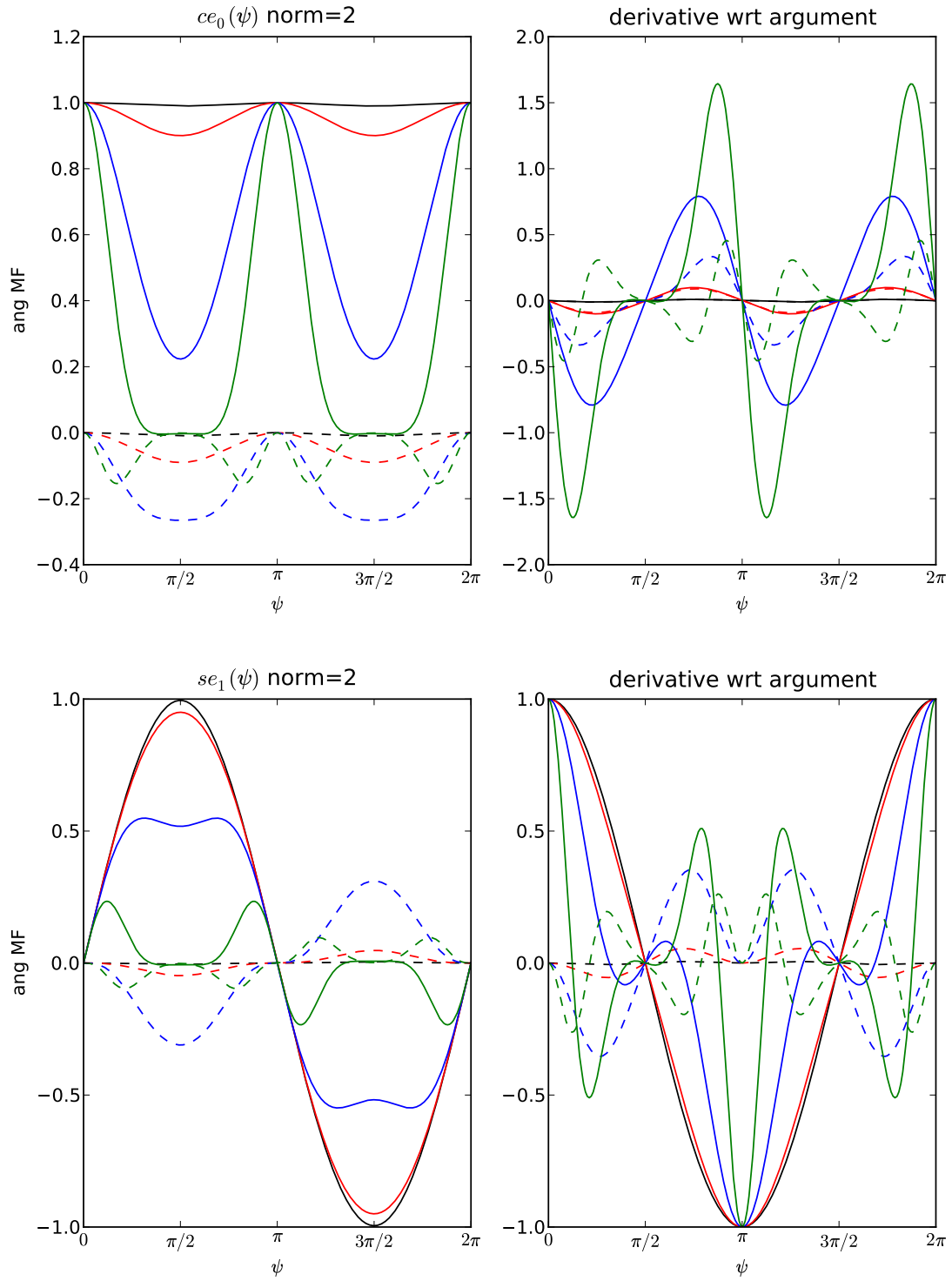


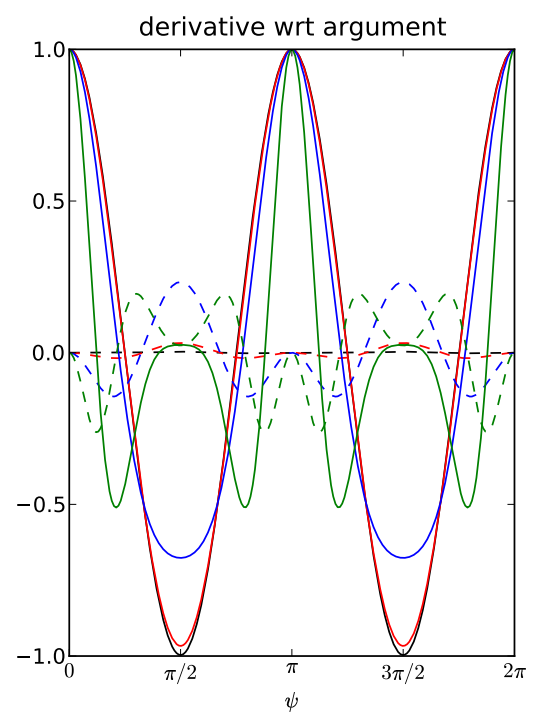
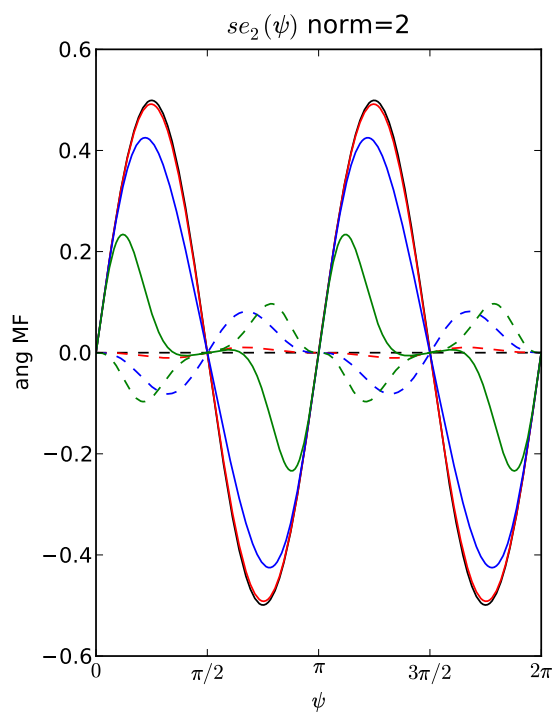
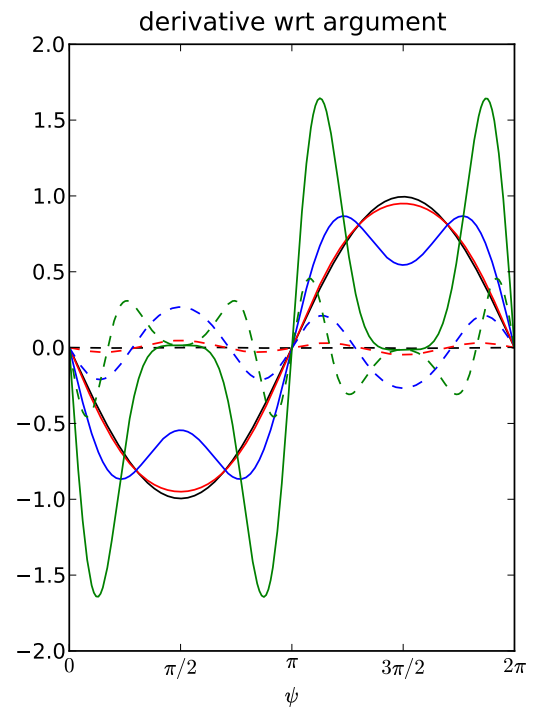
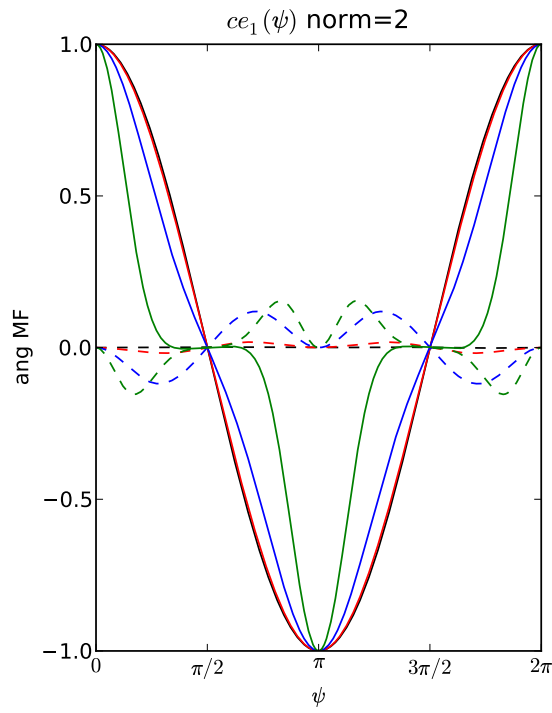


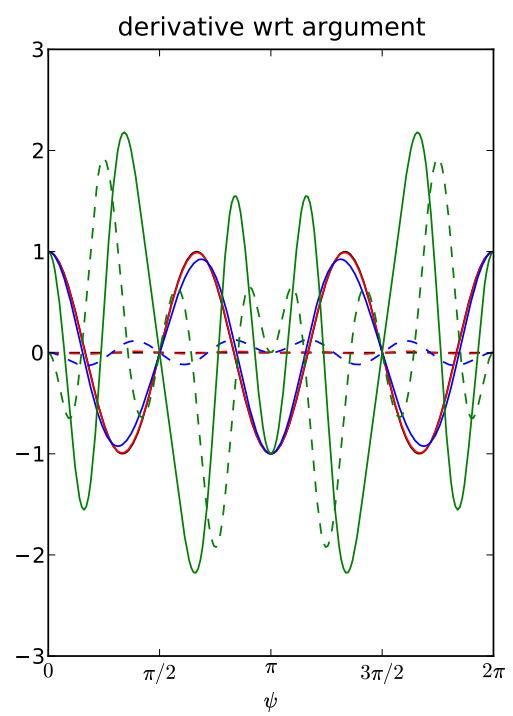
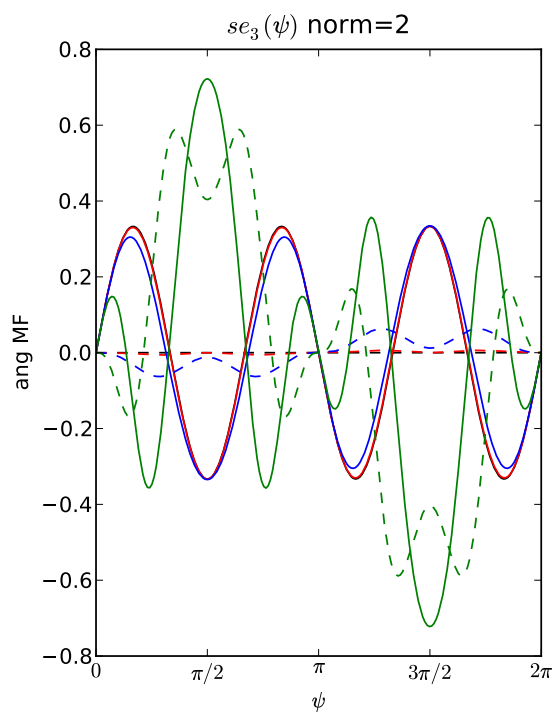
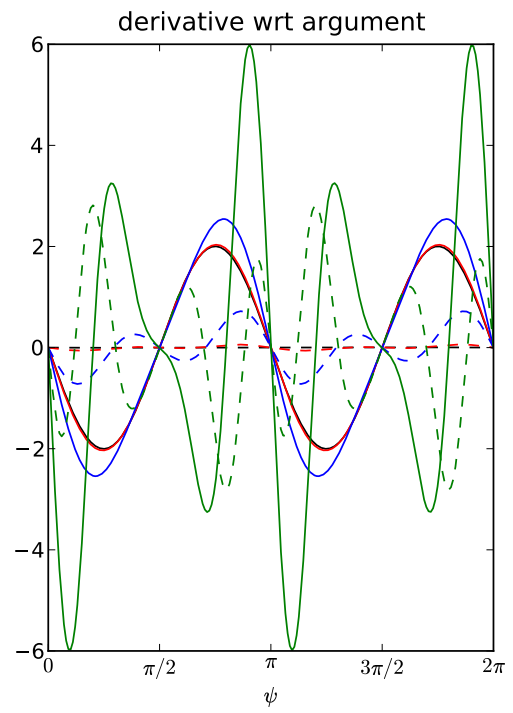
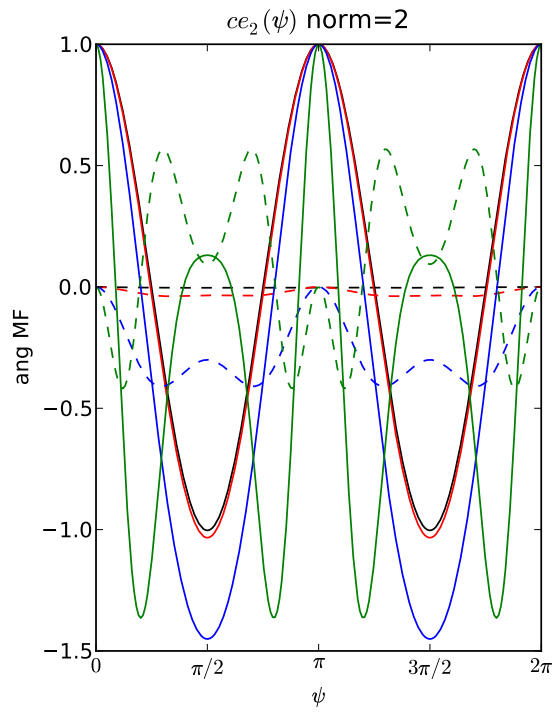


1.3 Constant order, variable complex q

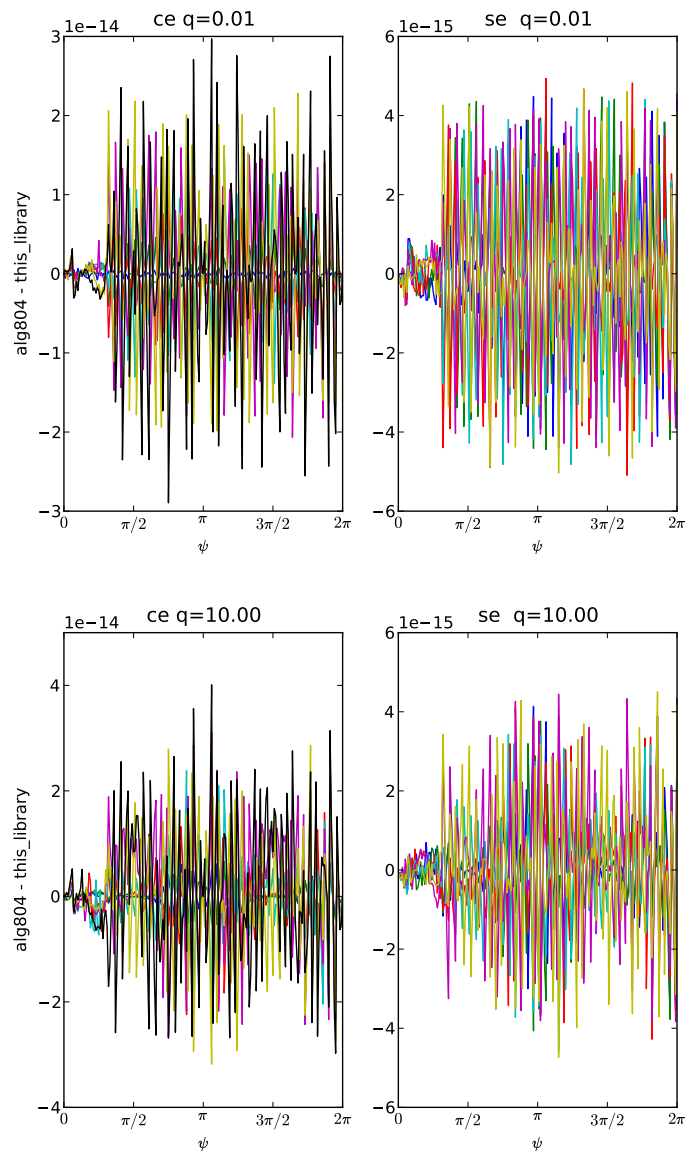
\Re =solid, \Im =dashed: $q = x + xi$, $x \in [0.01, 0.1, 1.0, 10.0]$

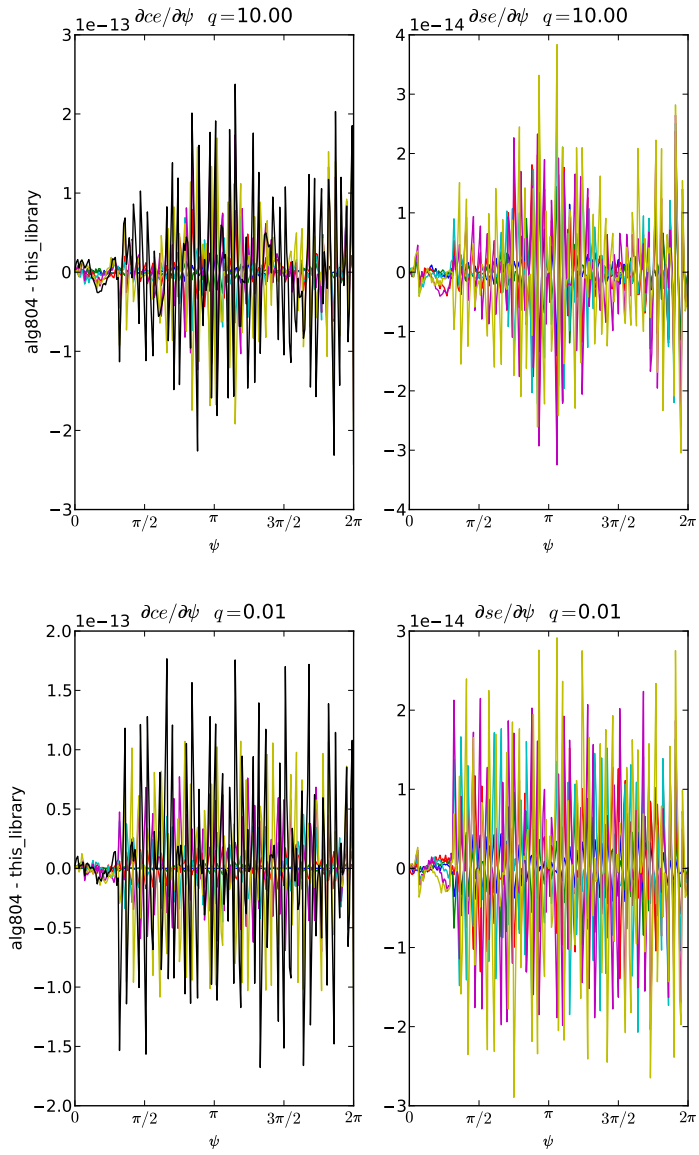


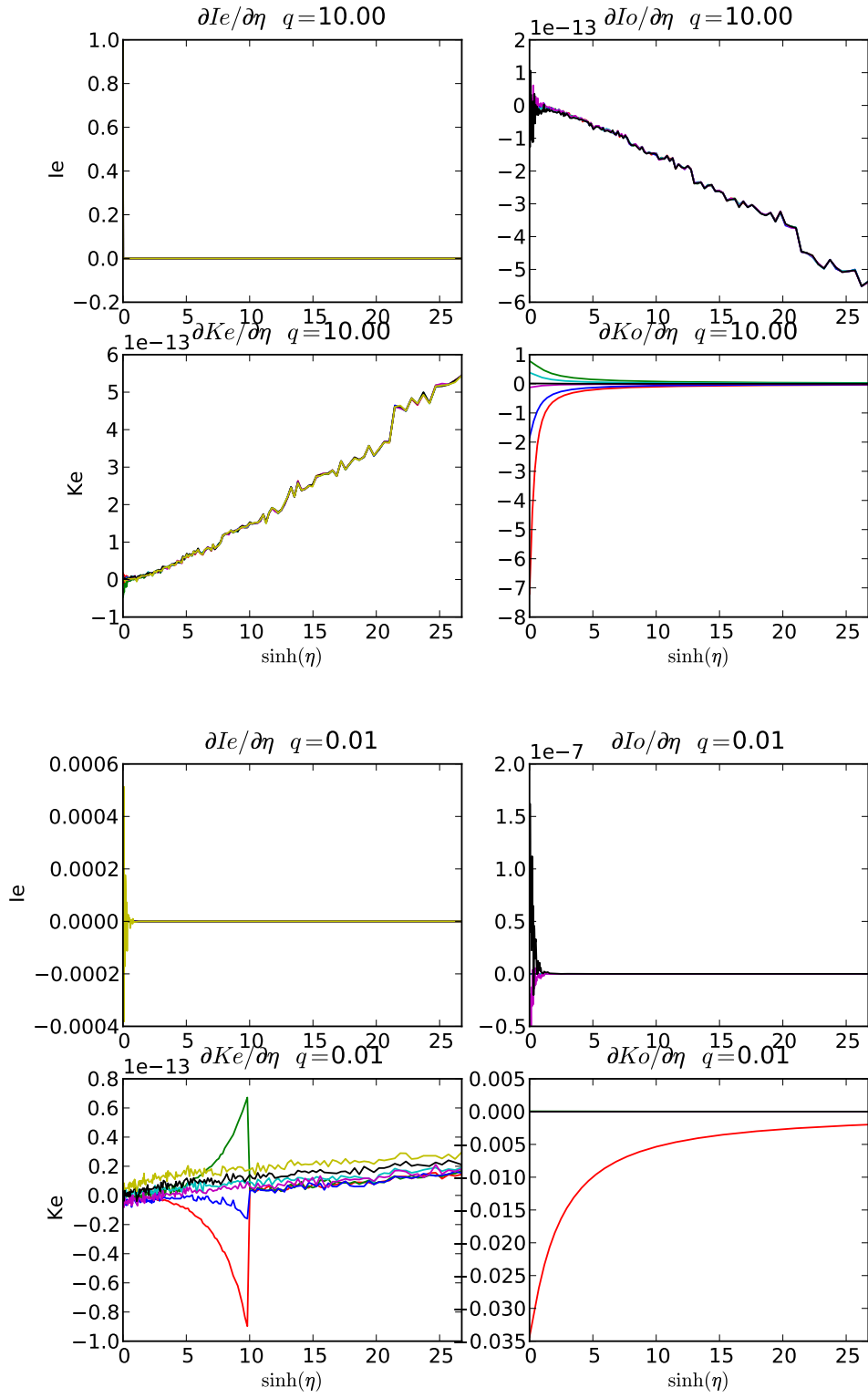


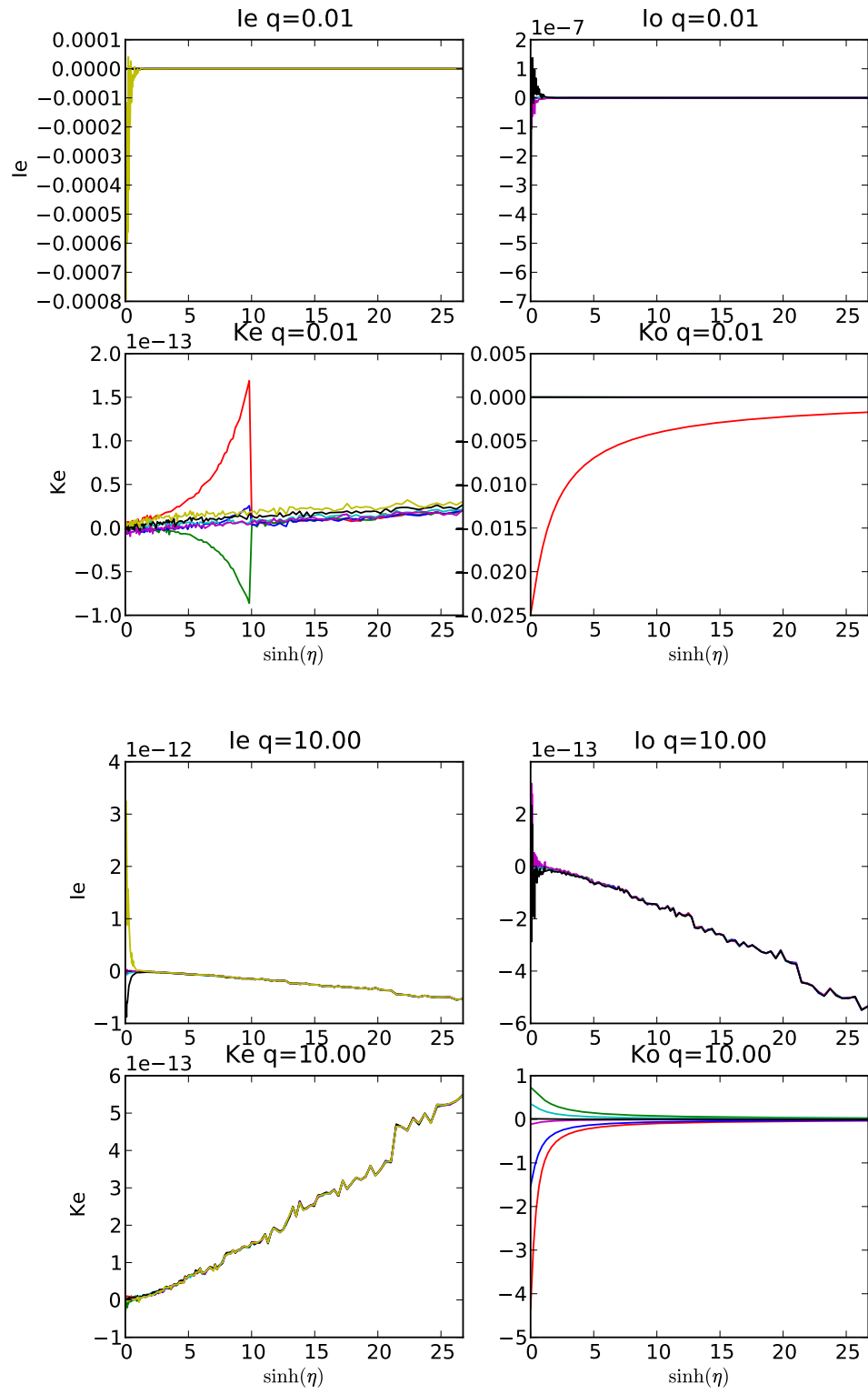


1.4 Compare these functions to Alhargans for real q



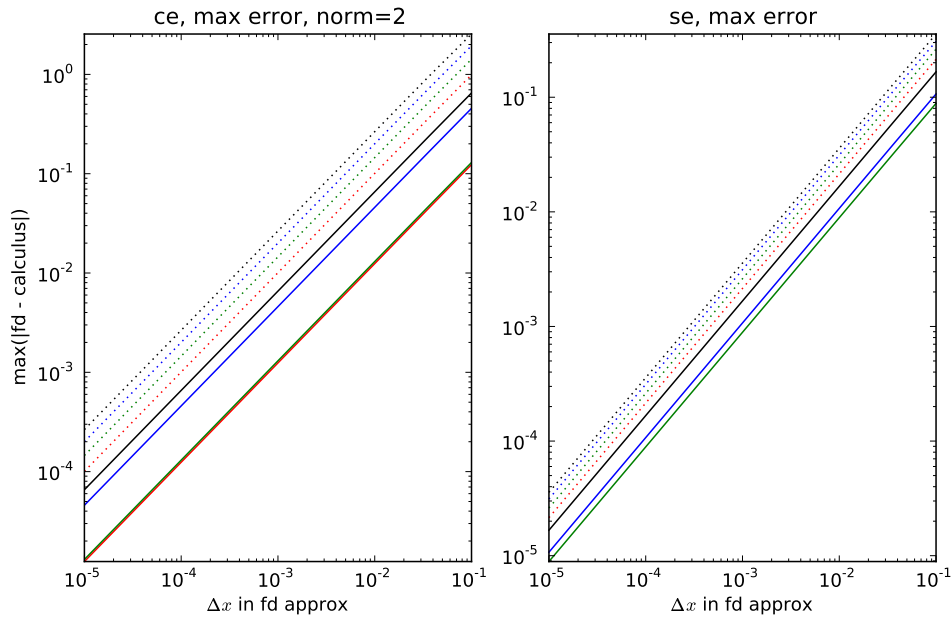


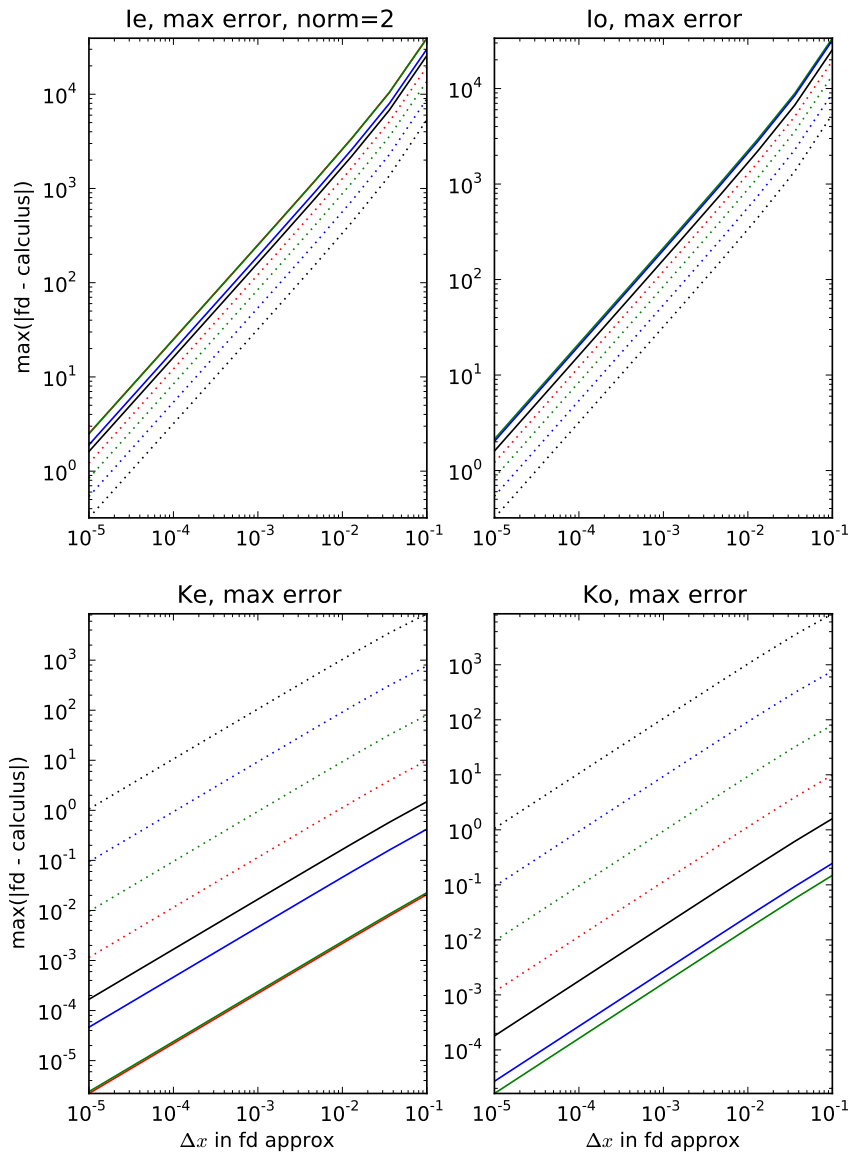




2 Check derivative functions

Each derivative function is compared with a finite-difference approximation of the derivative of the original function, with variable step size. A straight line in log-space indicates the finite-difference approximation error is the controlling error between the two approaches. The maximum absolute error across a range of arguments is plotted against finite-difference step size. The different lines represent functions of different order (higher order functions having errors greater by a constant in log space).

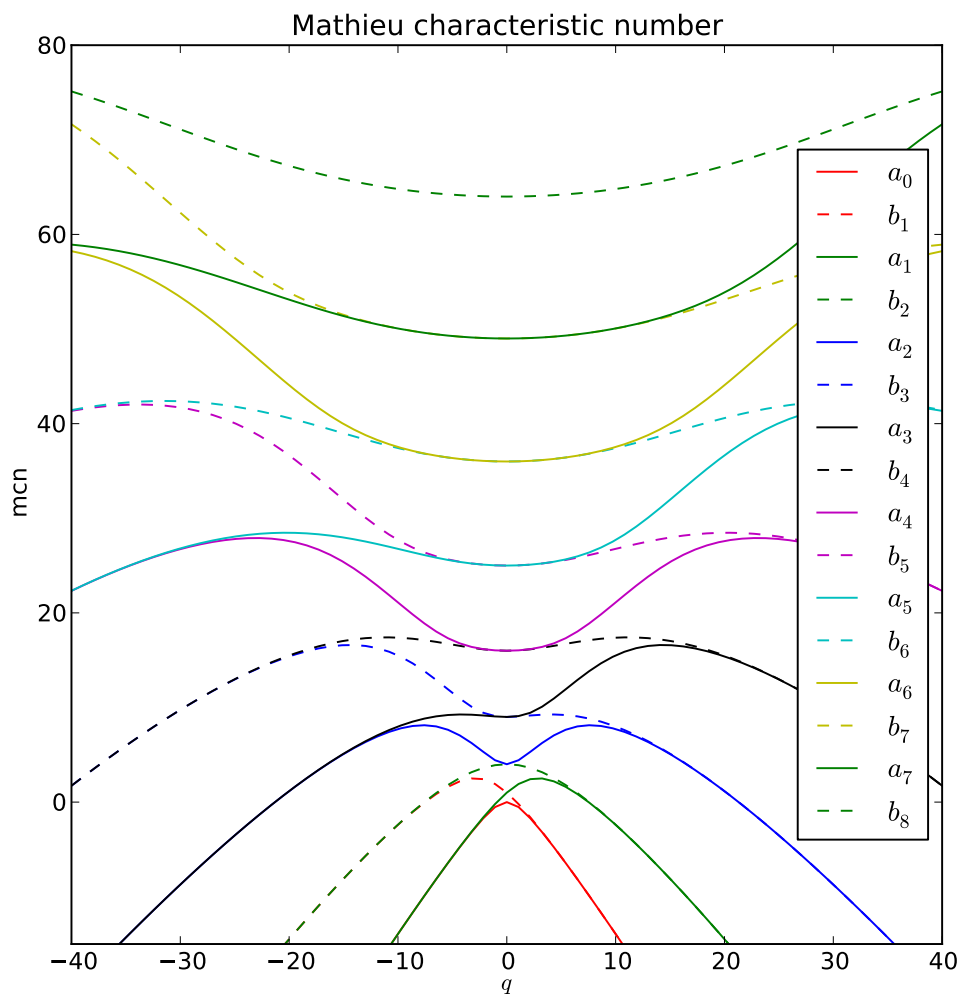




3 Mathieu MCN check

3.1 Real q

This shows how the Mathieu characteristic numbers vary as a function of the Mathieu parameter q , for real q . This figure in one form or another (or just the $q \geq 0$ portion) is shown in most books or papers with coverage of Mathieu functions. The following expressions describe the symmetry in the figures $a_{2m}(-q) = a_{2m}(q)$; $b_{2m+2}(-q) = b_{2m+2}(q)$; $a_{2m+1}(-q) = b_{2m+1}(q)$ (see Blanch and Clemm, 1969). Modified Mathieu functions correspond to the left half of this figure.



These figures show the Mathieu Characteristic Number (MCN) as a function of the complex Mathieu parameter q . The numerical values for the double points are taken from Blanch and Clemm (Math. of Comp., 1969). Stars indicate the double points assigned to the mcn that the figure is titled after; circles indicate double points shared with an mcn two orders away. The branch cuts associated with the branch points are different than those in the large handbook reference by Blanch and Clemm, but they are determined by LAPACK, which does the eigenvalue analysis.

