Singularities often occur in solutions to partial differential equations: important examples include the formation of shock fronts in hyperbolic equations and self-focusing type blow up in nonlinear parabolic equations. Information about formation and structure of singularities can have significant theoretical importance. For example, the question of singularity formation for the 3D Euler equations of incompressible inviscid flow has important implications in turbulence, and has been an open problem for more than a century. In this talk, we present a new method for the numerical analysis of complex singularities in solutions to partial differential equations. In the method, we analyze the decay of Fourier coefficients using a numerical form fit to ascertain the nature of singularities in two and three-dimensional functions. Our results generalize a well-known method for the analysis of singularities in one-dimensional functions to higher dimensions. As an example, we apply this method to analyze the complex singularities for the 2D inviscid Burger equations.