1096-39-772 **Ronald E. Mickens*** (rmickens@cau.edu), Clark Atlanta University, Box 1744-, Physics Department, Atlanta, GA 30314. *Global Dynamics and Bifurcation of Difference Equations.*

In general, an arbitrary differential equation does not have solutions expressible in terms of a finite combination of elementary functions and, as a consequence, must be discretized to determine numerical solutions. Numerical Instabilities (NI) are solutions to the discretized equations which have no correspondence to solutions of the original differential equations. We show, through explicit examples, that NI's are bifurcation phenomena. They arise from the fact that the parameter space of the discrete equations is always greater than the parameter space of the differential equations. These additional parameters arise from the introduction of time and/or space step-sizes in the construction of the discrete-derivative analogs of the continuous derivatives. We demonstrate that the Nonstandard Finite Difference (NSFD) methodology of Mickens can be used to eliminate NI's for (at least) first-order ODE's. For these equations there are three types of mechanisms for the occurrence of NI's (bifurcations); we label them "threshold", "order", and "creation" bifurcations. These two references provide the background required to comprehend our presentation. (Received September 10, 2013)