1027-33-109 **Carl M. Bender*** (cmb@wustl.edu), Physics Department, Campus Box 1105, Washington University, St. Louis, MO 63130. *Nonlinear Integral-Equation Formulation of Orthogonal Polynomials.*

The nonlinear integral equation $P(x) = \int_\alpha^\beta dy\, w(y)\, P(y)\, P(x+y)$ is investigated. It is shown that for a given function $w(x)$ the equation admits an infinite set of polynomial solutions $P(x)$. For polynomial solutions, this nonlinear integral equation reduces to a finite set of coupled linear algebraic equations for the coefficients of the polynomials. Interestingly, the set of polynomial solutions is orthogonal with respect to the measure $x\, w(x)$. The nonlinear integral equation can be used to specify all orthogonal polynomials in a simple and compact way. This integral equation provides a natural vehicle for extending the theory of orthogonal polynomials into the complex domain. Generalizations of the integral equation are discussed. (Received February 21, 2007)