1014-41-1489 **Paul G. Warne*** (warnepg@jmu.edu), Department of Mathematics and Statistics, Harrisonburg, VA 22807, and **Debra A. Warne**. *The Algebraic-Maclaurin-Pade' Rational Polynomial Approximation for ODE BVPs.* Preliminary report.

Many predominant numerical algorithms used to approximate solutions of nonlinear boundary-value problems (BVPs) have a Runge-Kutta foundation. A shooting algorithm using a foundation of our Algebraic-Maclaurin-Pade' (AMP) method can potentially produce remarkable accuracy in significantly less time near a singularity. This produces an effective numerical technique for BVPs, as it numerically generates and stores the coefficients of the Taylor polynomial of the solution at each step for each term of the series. The Taylor coefficients are then used to numerically create the coefficients of a rational polynomial Pade' approximation to the solution at each step for singular BVPs. Pade' approximations are intimately related to continued fractions. Our AMP algorithm allows for a smaller number of steps as the solution marches toward the singularity and provides a simple manner in which to increase (or decrease) the order of the algorithm during the computation, resulting in general in a more accurate solution nearby and at the singularity. The method is developed theoretically and then applied to several nonlinear and singular BVPs in nonlinear solid mechanics. This approach to solving ODE BVPs is a powerful new application of rational polynomials. (Received September 28, 2005)