1056-35-241 **Myles D Baker*** (myles_baker@baylor.edu), Myles Baker c/o Qin Sheng, Department of Mathematics - Baylor University, One Bear Place #97328, Waco, TX 76798-7328, and **Sarah R Farell** (sf457@bard.edu), Bard College, 30 Campus Rd., Annandale-On-Hudson, NY 12504.

Approximating Convection Dominated Diffusion PDEs Using an Adaptively Weighted Least Squares Finite Element Approach. Preliminary report.

PDEs of the convection-diffusion-reaction form have unique exact solutions that are very difficult to find, and numerical approaches to those solutions give rise to error as a byproduct of approximation. Due to the nature of computational methods for solving PDEs, cost-efficiency is important; boundary layers of elliptical PDEs cause solutions of the least-squares approach to be overly smoothed and our goal is to improve the least-squares method by using an adaptively weighted approach in the most computationally effective way. We develop a new least-squares finite element method that works in conjunction with adaptive mesh refinement to globally balance error in approximations. This method also allows us to improve solutions in terms of both accuracy and computational cost. We use FreeFem++ to illustrate how our adaptive weighted methods affect approximated solutions to convection-dominated diffusion PDEs. We extend this method by applying it to functions with particularly tricky exact solutions, such as the Navier-Stokes equations. (Received September 19, 2009)