1023-65-1049 **Susanne C Brenner** (brenner@math.lsu.edu) and **Luke N Owens*** (owensl@math.sc.edu).
A W-Cycle Multigrid Algorithm for a New NIPG Method.

We introduce a new non-symmetric interior penalty discontinuous Galerkin (NIPG) method for solving elliptic boundary value problems. The new NIPG method introduced has h-optimal error estimates in both the energy norm and L2 norm. Also, although the resulting global stiffness matrix has a condition number of order h^{-4}, there is a simple preconditioner that reduces the condition number to $O(h^{-2})$. This is a significant advantage when designing a good smoothing procedure for multigrid algorithms. We then prove that there is a bound (< 1) for the contraction number of the W-cycle algorithm, which is independent of the mesh level, for an appropriately chosen number of smoothing steps. (Received September 24, 2006)