1023-83-1861 **Michael J Holst*** (mholst@math.ucsd.edu), University of California, San Diego, Department of Mathematics, 9500 Gilman Drive, Dept. 0112, La Jolla, CA 92093. *Some Results on Constraints in GR.*

In this lecture, we consider several questions regarding the coupled Hamiltonian and momentum constraints in the Einstein equations. First, we give an overview of some analytical results for the Hamiltonian constraint on manifolds with boundary, including a priori max-norm estimates and existence results for weak (or rough) solutions. We then summarize related results for the momentum constraint, and outline an argument for establishing existence of rough solutions to the coupled system.

We then review the existing approximation theory for Galerkin methods applied to the constraints, and describe a new adaptive algorithm AFEM. We show rigorously that AFEM converges to rough solutions of the Hamiltonian constraint in certain physical settings. We outline an extension of the argument for more general settings and for the coupled system, and we discuss complexity and optimality of the adaptive algorithm.

Time permitting, we describe some related work on enforcing constraints in evolution systems in GR. (Received September 27, 2006)