1030-35-142 **Chang-Yeol Jung** (chajung@indiana.edu), Institute for Scientific Computing, and Applied Mathematics, Indiana University, Bloomington, IN 47405, and **Roger Temam*** (temam@indiana.edu), Institute for Scientific Computing, and Applied Mathematics, Indiana University, Bloomington, IN 47405. *Approximation of convection-diffusion equations with multiple boundary layers.*

We consider singularly perturbed convection-diffusion equations in 2-dimensional spaces which are suitable linearization of Navier-Stokes equations with a small viscosiry. These problems are known to display the so-called boundary layers at the boundaries as long as the solutions of their limit problems (i.e. viscosity = 0) are smooth; if the limit solutions have discontinuities, we expect some interior layers as well as the boundary layers. We construct and analyze the boundary layers which are ordindary and parabolic types. In such cases typically the numerical schemes require very fine meshes near the boundary layers. We will demonstrate how one can improve such numerical solutions by incorporating the structures of boundary layers into finite element spaces, which results in significant simplifications. (Received July 30, 2007)