1052-35-351 **Katarina Jegdic*** (jegdick@uhd.edu), One Main Street, University of Houston - Downtown, CMS Department, Houston, TX 77002, and **Barbara Lee Keyfitz** and **Suncica Canic**.

Transonic regular reflection for the isentropic gas dynamics equations.

We consider a two-dimensional Riemann problem for the isentropic gas dynamics equations with the initial data chosen so that the solution results in regular reflection with a subsonic state behind the reflected shock. We study the problem near the reflection point and we ignore interaction of linear waves with reflected shocks and effects of vorticity. We write the problem in self-similar coordinates and we obtain a mixed type system and a free boundary problem for the reflected shock and a subsonic state behind the reflected shock. We rewrite this first order system using a second order equation for density and two first order equations for velocities, and we rewrite the jump conditions across the free boundary using an oblique derivative boundary condition for density, Dirichlet conditions for velocities and an ordinary differential equation for the position of the free boundary. We show existence of a local solution to this nonlinear free boundary problem using estimates for the solutions of the second order elliptic equations with mixed boundary conditions, compactness arguments and the Banach contraction principle. (Received September 01, 2009)