1100-35-17 **Katarina Jegdic*** (jegdick@uhd.edu), University of Houston - Downtown, Department of Mathematics and Statistics, One Main Street, Houston, TX 77002. *A free boundary approach for solving a Riemann problem for the isentropic gas dynamics equations.*

In this talk we consider a two-dimensional Riemann problem for the isentropic gas dynamics equations. The initial data is chosen in such a way that the resulting solution corresponds to the case of transonic (or strong) regular shock reflection. We rewrite the problem in self-similar coordinates and we obtain a mixed free boundary problem for the reflected shock and the subsonic state behind the shock. We further rewrite the problem using the Rankine-Hugoniot shock equations and we obtain a second order elliptic problem for density, two hyperbolic equations for pseudo-velocities and an ordinary differential equation for the reflected shock. Using the theory of second order elliptic equations with mixed boundary conditions by Lieberman, Trudinger and Gilbarg, as well as various fixed point arguments, we prove existence of a solution to the above Riemann problem in a neighborhood of the reflection point. (Received February 03, 2014)