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Solution to the Nemchinov-Dyson Problem in 2-D Axial Geometry[1] JESSE GIRON[2], SCOTT RAMSEY, ROY BATY, Los Alamos National Laboratory — The purpose of this work is to examine the solutions to the 2-D inviscid compressible flow (Euler) equations in axial geometry subject to an ideal gas equation of state (EOS) constrained by the Nemchinov-Dyson assumption on the included velocity field. Assuming a separable solution for the flow velocities u_r and u_z which is defined as a linear spatial component and an arbitrary time function $R_r(t)$ and $R_z(t)$, respectively, we find we find several solution sets for density (ρ) , pressure (P), and specific internal energy (SIE) (I) that are constrained by two ordinary differential equations and arbitrary spatial dependence. These spatial functions are defined as $\Pi(\xi,\eta)$, $\beta(\xi,\eta)$, $\Upsilon(\xi,\eta)$ for ρ, P, and I, respectively, for similarity variables $\xi = r/R_r(t)$ and $\eta = z/R_z(t)$. Using various physically-relevant initial conditions, we find 11 unique numerical solutions to the functional form of $R_r(t)$ and $R_z(t)$. Using different initial density profiles, with assumptions connecting back to uniform thermodynamic properties, we derive specific unique spatial functions for ρ, P, and I. Finally, we show the overall solutions to ρ, P, and I.

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