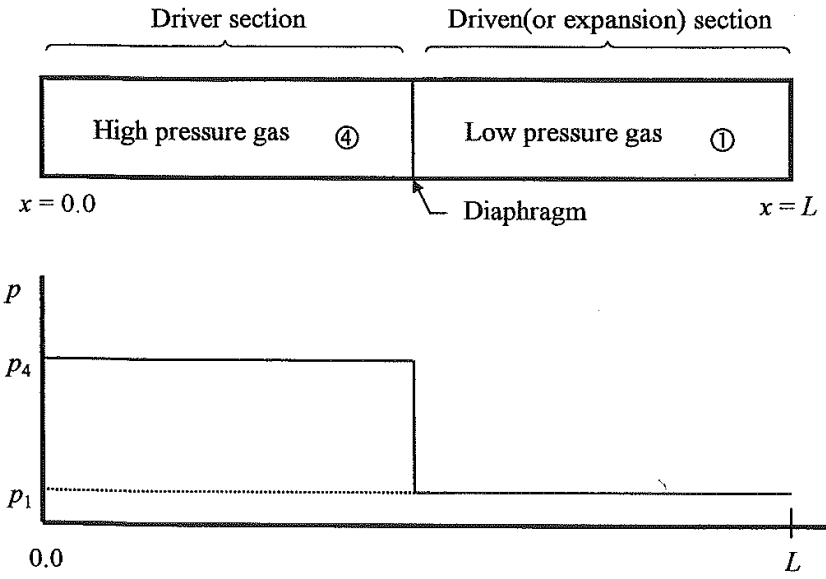
FLORIDA INSTITUTE OF TECHNOLOGY
MECHANICAL AND AEROSPACE ENGINEERING DEPARTMENT

MAE 5150-E1: Computational Fluid Dynamics
Fall 2017

Coding Project 4

Due November 30, 2017

Consider the following geometry and initial flow condition.



The non-dimensional parameters are: $L = 2.0$, $p_1 = 1.0$, $p_4 = 2.0$, $\gamma = 1.4$, $\rho_1 = 1.0$, and $\rho_4 = 2.0$.

Using the explicit Modified Steger-Warming scheme for the 1-D Euler equations, solve for this flow field in a time-accurate manner. Use $IM = 41$ and compute exactly 18 time steps. Because of the varying nature of the flow, Δt is not a constant, and will have to be determined from the Courant-like stability criterion. Use a Δt equal to 90% of the stability limit criterion.

Separately plot the final solution of velocity, pressure, and density each versus position. Overlay your solution with the analytic solution. Ensure that your plots have titles, axis labels, legends, etc. Turn in plots and code (code electronically and hardcopy) to complete this assignment. It is recommended (though not required) that you use MATLAB for this assignment.

Extra Credit: Repeat this problem using the explicit Roe Flux Difference Splitting scheme. Again, turn in plots and code as above. There is no partial extra credit. To receive extra credit, this portion of the assignment must be done correctly and in-full. Successfully completing this portion of the assignment will result in 4 points added to your final course grade.