



- Task 1: Run `Nalu/reg_tests/test_files/dgNonConformalThreeBlade`
  - a. Modify the input file to increase `termination_step_count` to  $\sim 500$ .
  - b. Visualize the flow field with displacements activated and provide a single image at the final step count.
  - c. How does modification of the blade rotation ( $\omega$ ) affect the time step?
  - d. Report any modifications that resulted in catastrophic behavior, i.e., the simulation diverged. Document how you caused the simulation to diverge.
- Task 2: Run `Nalu/reg_tests/test_files/fluidsPmrChtPeriodic`
  - a. Modify the input file to increase `termination_step_count` to  $\sim 500$ .
  - b. Visualize the temperature, velocity, and radiative file (your choice) and provide a single image at the final step count.
  - c. Modify the gravity constant such that the Rayleigh number is doubled and trippled. Report any findings.

## Homework #1 Task 3: Specified Pressure Drop Laminar Pipe Flow:



- Location: <https://github.com/spdmain/Present/tree/master/stanfordMe469/hw/one>
- You will modify the input file to provide the density, viscosity and pressure drop to achieve  $Re^\tau = 10$  and report on the differences between the simulation and analytical centerline velocity.
- Specifications:
  - $Re^\tau = 10$
  - Pipe diameter,  $D = 0.01$  m
  - Pipe Length,  $L = 0.2$  m
- a. Perform a global momentum balance to determine the pressure gradient.  $dp/dz$  as a function of the wall shear stress,  $\tau_w$ .
- b. Given  $Re^\tau = \rho u^\tau D / \mu$  and  $\tau_w = \rho (u^\tau)^2$ , where  $u^\tau$  is the wall friction velocity, report the required pressure gradient required for the desired  $Re^\tau = 10$ .
- c. Modify the input file to specify the proper density, viscosity and open pressure specification (look for the pressure specification under `open_user_data`).
- d. Run both the Hex8 and Tet4 input file and compare the simulation centerline velocity to the analytical result (feel free to derive or simply report the functional form).
- e. Capture any findings between the Hex8 and Tet4 simulation, e.g., simulation time, velocity component qualitative differences, convergence, etc.

