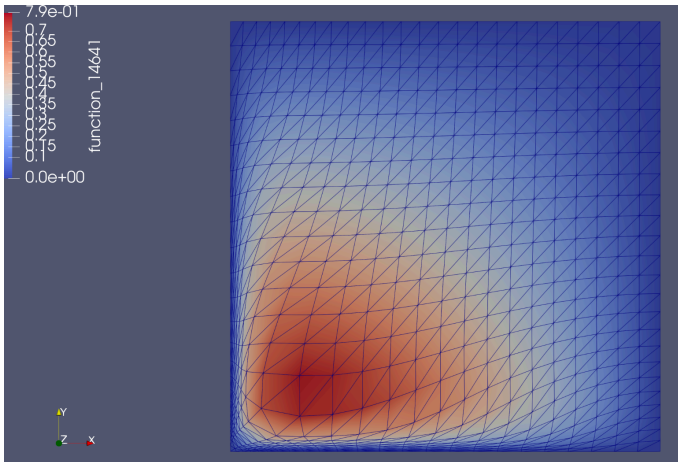
Why Did We Switch to The Hessian Based M

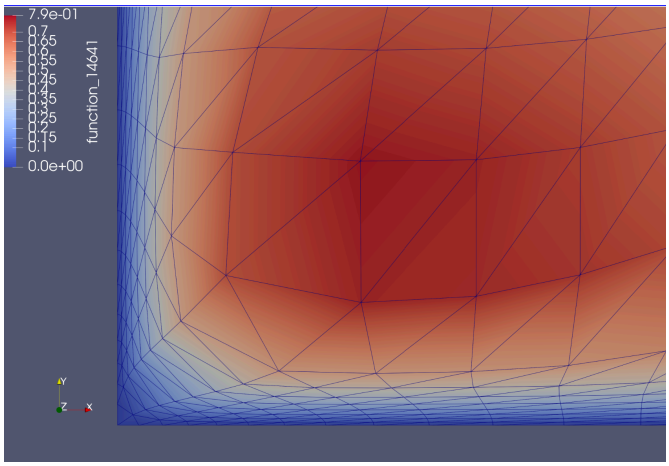
1D Tests

- I implemented the linear and nonlinear Winslow equations in 1D so that we could learn about some of the issues we were having in 2D
- For a Bakhvalov based M we got great results. For the gradient based M we were missing the “hump” in our solution.
- We tried to pick parameters to match |u’| with the Bakhvalov based M. In doing so, we learned that the best match we can make is by using |u’’|.
- We tried the 1D analog of the Hessian based M. This proved to be more successful than the gradient based M. We started thinking that we would have to move to the Hessian based M in 2D

2D tests

- In 2D we get good meshes for the Bakhvalov, solution independent M. We get bad meshes for the gradient based M.
- We suspected both a bad monitor function choice and a bug in my mesh solve
- To get a better look at the results, we started plotting our results in paraview. Upon doing so we found that
    - Over the final MP-Iteration (at eps ~ 0.04) the mesh did continue to adapt to the chosen M (gradient based)
    - Orthogonality was being enforced
    - We were getting some resolution at the origin but that we did not have the placement of points that we would have liked
- These results told us that the Mesh Solve was working as we would expect for the given M. The issues seemed to be coming from our chosen M (not large along the whole axes, not placing enough points in the “hump” of the solution).





→**Therefore, we decided to switch to the Hessian based M in HR** ((5.192),(5.193))