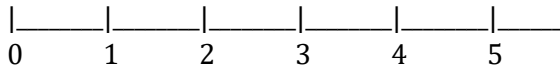


MAE 6263
Computational Fluid Dynamics
Spring 2021

HW1

Due: Feb 4th 2021(4:30 pm) >Canvas>Assignment Dropbox >As a single pdf

1. Consider the following discretization



with the Neumann boundary condition at point 0 (i.e., $u' = 0$, where the superscript ' refers to the first derivative along the axis)

- a. Derive a third order finite difference stencil/formula for computing u'' at point 1. (This should satisfy the $u'=0$ b.c. at point 0.)
Stencil should start using u data from points 0,1,2, ...,n, and what would be the least n for the third order accurate representation?
 - b. Derive a fourth order finite difference stencil/formula for computing u'' at point 1. (This should satisfy the $u'=0$ b.c. at point 0.)
Stencil should start using u data from points 0,1,2, ...,n, and what would be the least n for the fourth order accurate representation?
 - c. Derive a third order finite difference stencil/formula for computing u'' at point 0. (This should satisfy the $u'=0$ b.c. at point 0.)
Stencil should start using u data from points 0,1,2, ...,n, and what would be the least n for the third order accurate representation?
 - d. Derive a fourth order finite difference stencil/formula for computing u'' at point 0. (This should satisfy the $u'=0$ b.c. at point 0.)
Stencil should start using u data from points 0,1,2, ...,n, and what would be the least n for the fourth order accurate representation?
2. Writing your own codes/scripts, please regenerate resulting figures for the application problem outlined in the lecture notes > week-2a > slide numbers between 33 and 45.