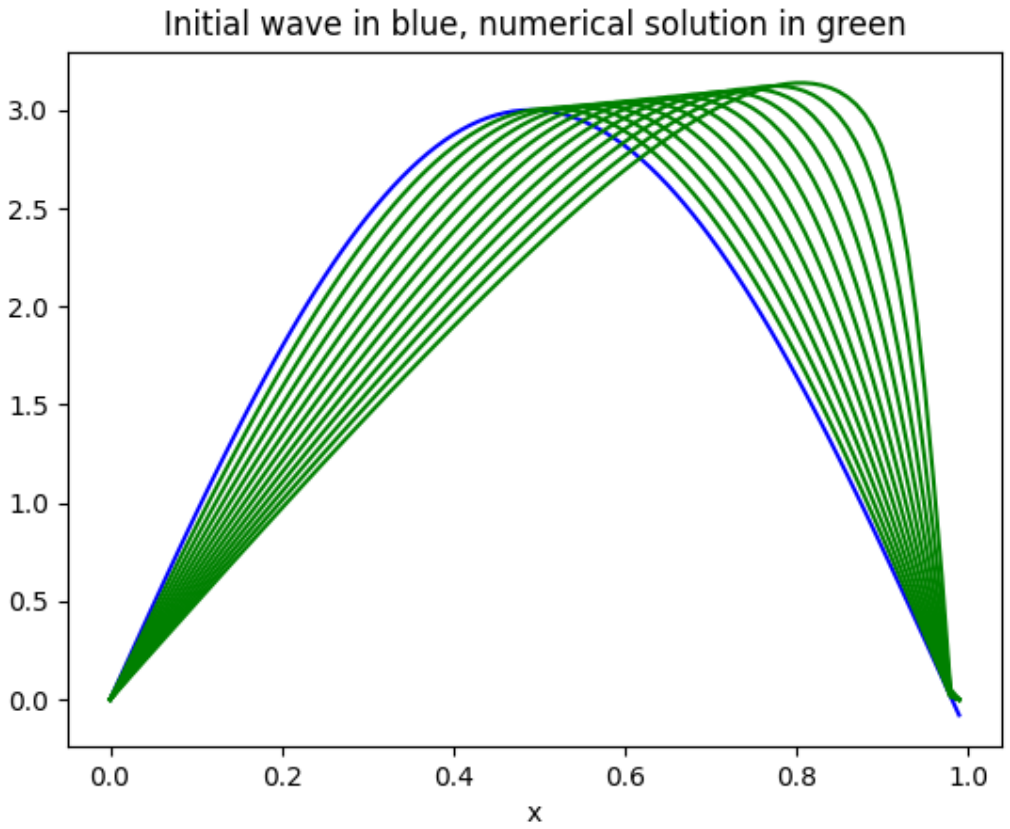
Computational Physics Assignment 5

This assignment dealt with the implementation of the Lax-Wendroff method to solve the Burgers' equation using second-order differences for the time derivative and Burgers' equation itself to relate derivatives.

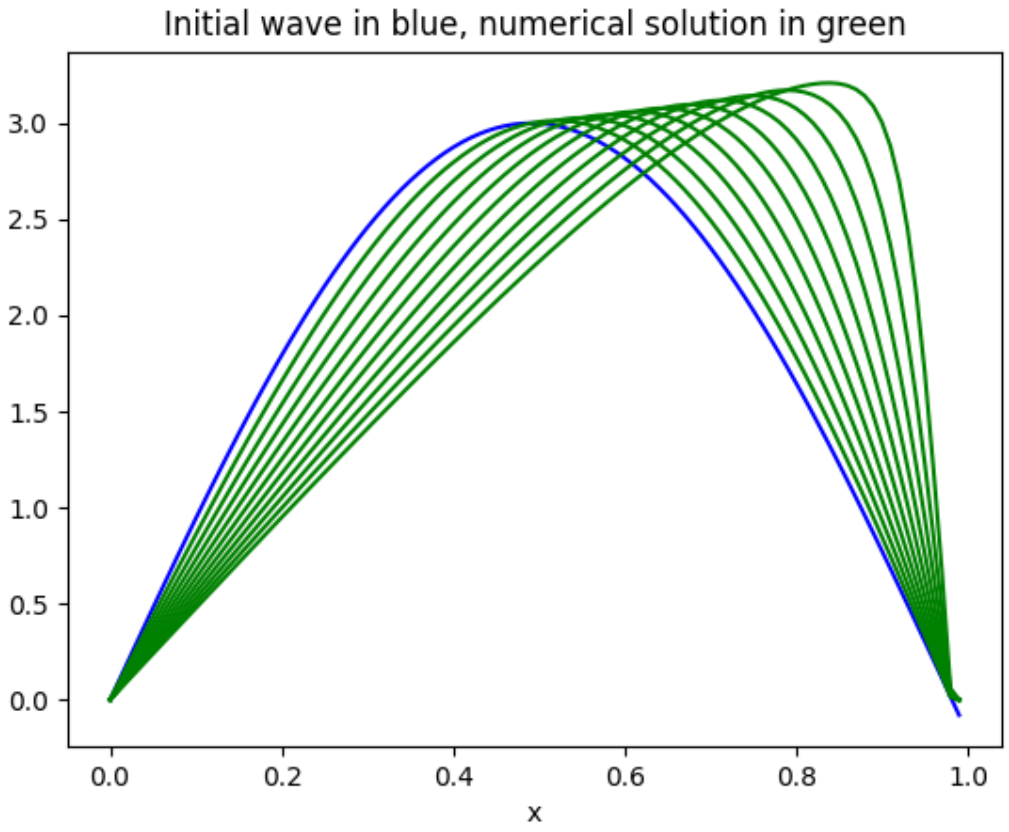
Tasks a) through d) were implemented in the code attached with this report.

For part e):

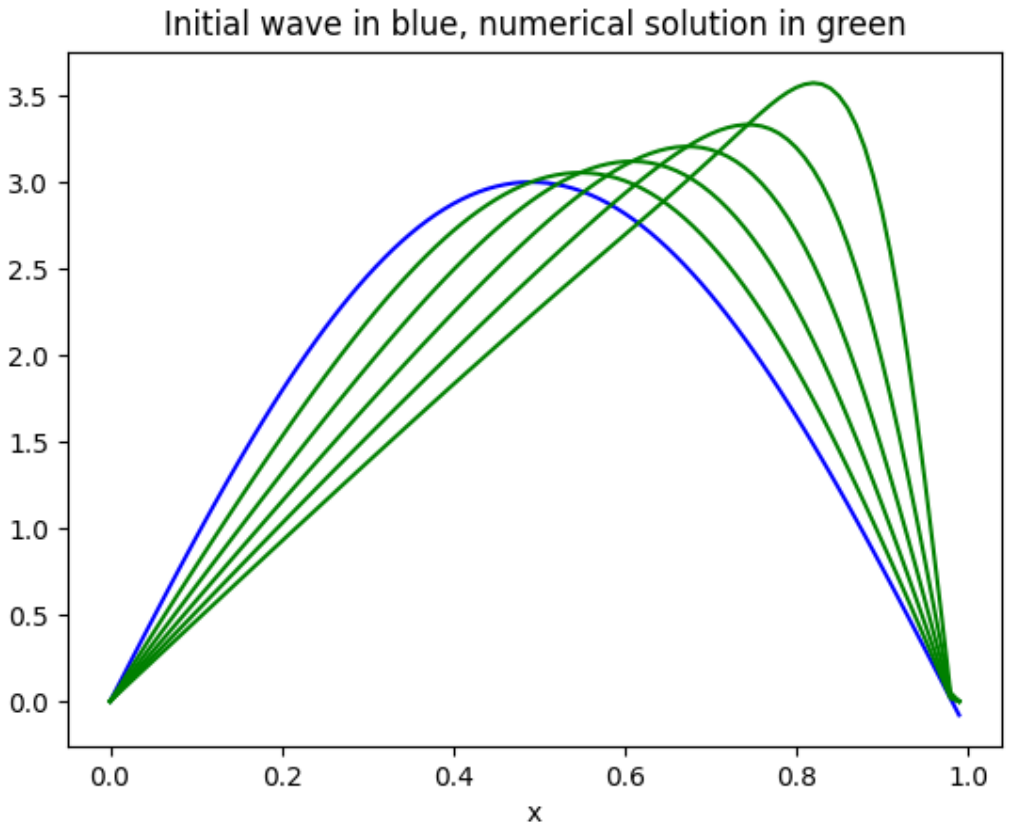


For Part f):

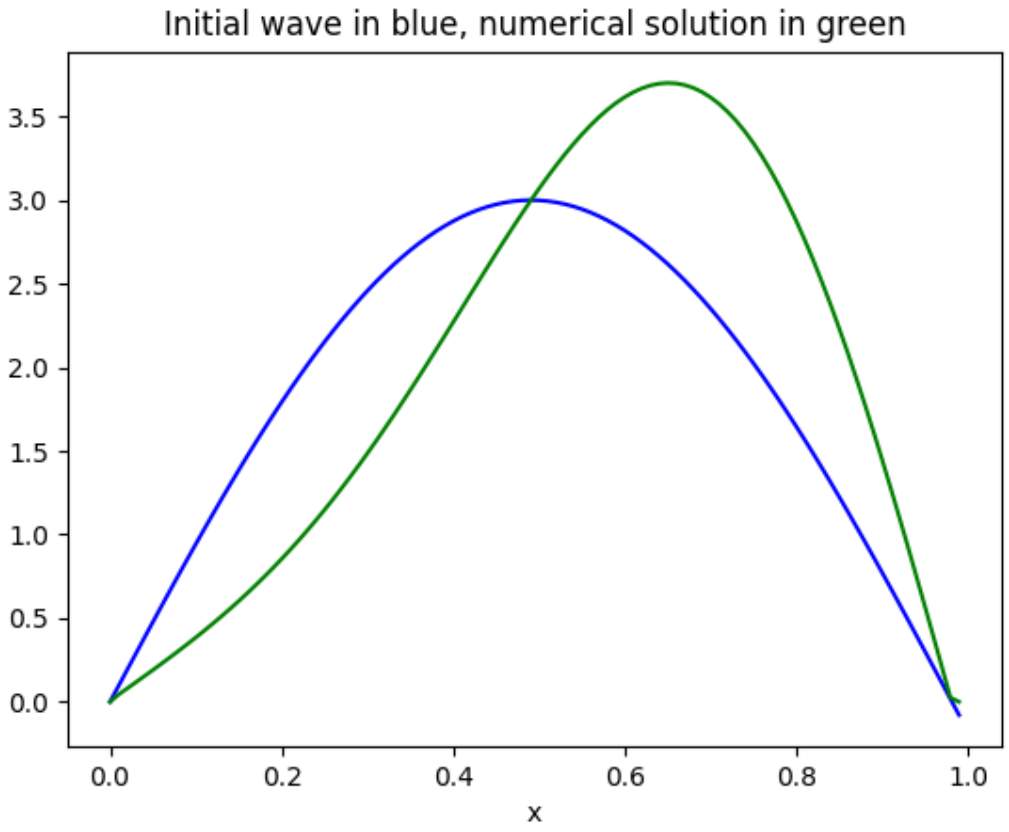
Beta =1


Initial wave in blue, numerical solution in green
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.2
0.4
0.6
0.8
1.0
x

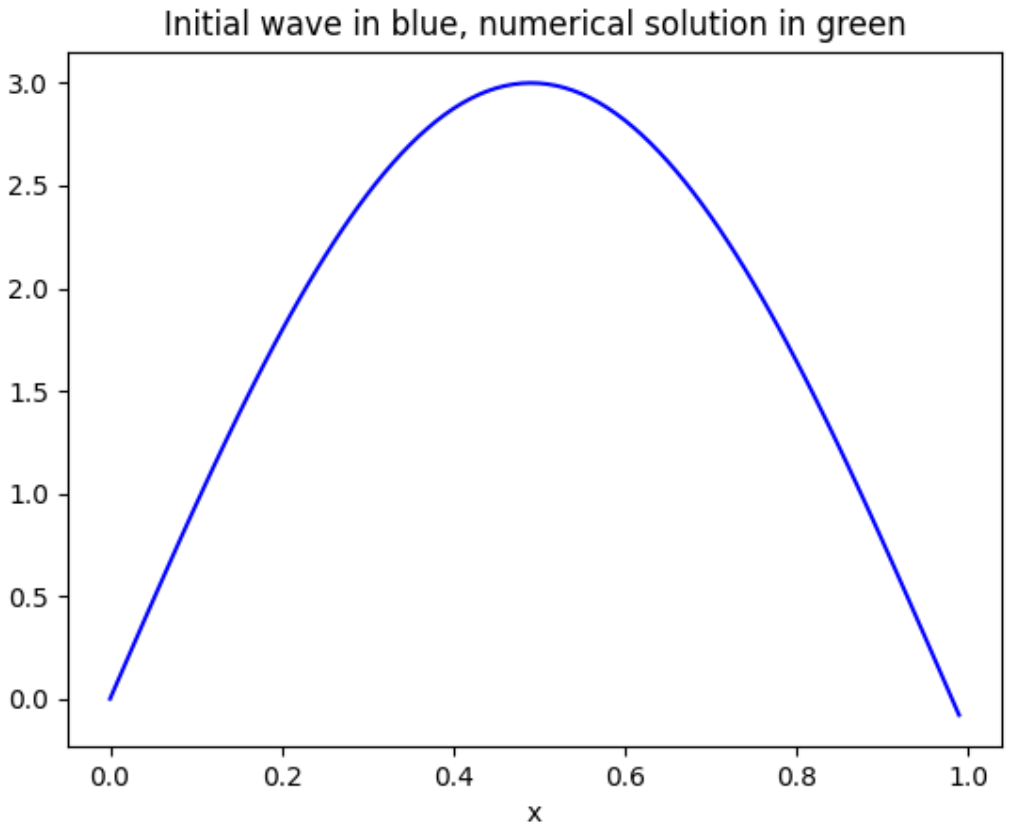
Beta = 2


Initial wave in blue, numerical solution in green
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.2
0.4
0.6
0.8
1.0
x

Beta = 8


Initial wave in blue, numerical solution in green
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.2
0.4
0.6
0.8
1.0
x

Beta = 25



As seen above, the stability condition $\beta < 1$ is correct for this nonlinear problem since the solutions get distorted when β increases and when the β is too high, there is no solution to be seen.