

Assignment 7

Math 528L Fall 2021

Due 10/17 (Sunday at 11:59 pm)

1 Backward Euler Methods

- (a) Write a program to implement Backward Euler for the ODE: $y' = -20y$. Use a step size $h = 0.05$ and a final time $T = 3$.
- (b) Using Mathematica's "Complexregionplot" function, plot the stability region for Backward Euler and the forward Euler Method.
- (c) For our value of $\lambda = -20$, what is the boundary value for our step-size for Forward Euler? Is there one for Backward Euler?
- (d) Use that Forward Euler boundary value from the last problem, lets call it H_b , to solve our ODE $y' = -20y$ using both Backward and Forward Euler. Plot the exact solution green, Backward Euler blue, and Forward Euler red all on the same plot.
- (e) Repeat the previous problem, but do it for both half and double H_b ? Explain your observations.