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Subject: Assignment 7 - Problem 2 - approach framework
Date: 25 January 2023 at 11:49 AM
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Assignment 7

Wednesday, 25 January 2023
12:34 AM

a) $\frac{dy}{dt} = -10^5 y + 99{,}999\, e^{-t}$ $\quad y(0) = 0$ $\quad t \in [0, 2]$

to get limit of step size for stability, we take the homo

$$\frac{dy}{dt} = -ay$$

{insert theory from chapra}

$h < \frac{2}{a}$ to maintain stability

$$h < \frac{2}{10^5}$$

$$h < 2 \times 10^{-5}$$

↓
step size.

now we can do explicit euler with $h = 2 \times 10^{-5}$ or $h <$

b) implicit euler:

$$y_{i+1} = y_i + \frac{dy_{i+1}}{dt} h$$

$$y_{i+1} = y_i + \left(-10^5 y_{i+1} + 99999\, e^{-t_{i+1}}\right) h$$

$$y_{i+1}\left(1 + 10^5 h\right) = y_i + 99999\, e^{-t_{i+1}} h$$

$$y_{i+1} = \frac{y_i + 99999\, h\, e^{-t_{i+1}}}{}$$

$1 + 10^{-5}$ h

now we can use this equation to update $y_i \rightarrow y$ every step.

NOTE: The theory here is just to determine the step size update eqn.
When you are writing approach, use this as the
fill it in with more theory from chapra. (And
why we are doing these and the theory behind th
[Directed to sumedh, from