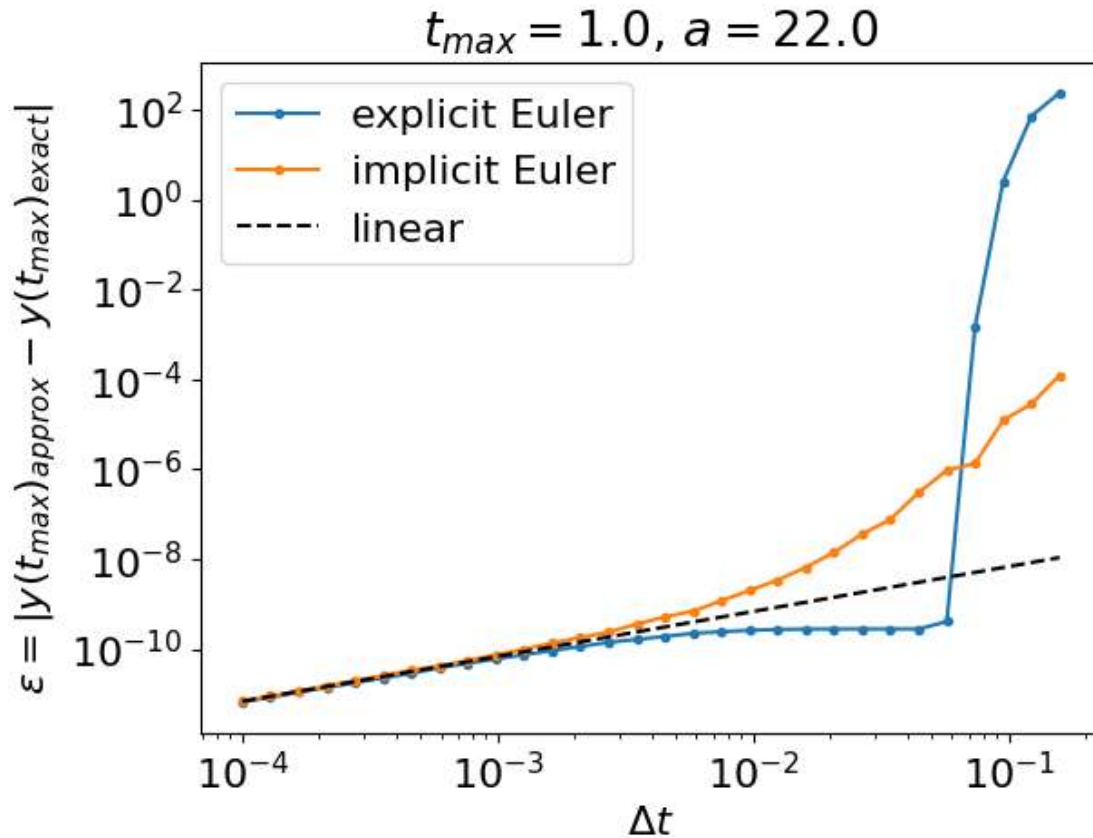


7.5 Result error in solution vs timestep



8 Exercises session 1

1. What is meant by the following?
 - local truncation error
 - global truncation error
 - order of an algorithm
 - finite difference method
2. What is the difference between an implicit and explicit relation?
3. Implement the explicit Euler method in a programming language (preferably Python), and with it solve the ODE

$$\frac{dy(t)}{dt} = bt - ay(t)$$

The coefficients should be implemented as variables, but take $b = 1$, $a = 22$, $y(0) = 1$, $t_{\max} = 1$, and integrate using both $\Delta t = 0.01$ and $\Delta t = 0.1$

4. Implement the implicit Euler method and solve the same ODE.

5. The analytical solution is

$$y(t) = e^{-at} \left(y_0 + \frac{b}{a^2} \right) + \frac{bt}{a} - \frac{b}{a^2}$$

Compare the errors for the two algorithms and plot the solution for each of them and the analytical solution vs time, $y(t)$.