1. Use the centered scheme \( u_{i+1} = u_{i-1} + 2hf(x_i, u_i) \) to solve the equations (i) \( y' = -y \) and (ii) \( y' = y \) for \( 0 \leq x \leq 3 \) with \( y(0) = 1 \). To start the recursion you need a value for \( u_1 \), get it from Euler’s scheme. Use \( h = 0.025 \). In each case, plot the relative error \( (u_i - y(x))/y(x) \), where \( ih = x \) (you can do it because you know \( y(x) \)). In the case (i), do another run with \( h = 0.025/3 \). Use this second run to attempt an extrapolation to \( O(h^4) \). Comment on what you see.

2. The scheme \( u_{i+1} = -1.5u_i + 3u_{i-1} - 0.5u_{i-2} + 3hf(x_i, u_i) \) has a truncation error \( O(h^3) \) (see theory homework). Try to use it to solve \( y' = -y \), \( y(0) = 1 \) in \( 0 \leq x \leq 3 \), and comment on what you see.