

NMA – homework from week 5

System of equations

Consider Cauchy problem

$$Y' = \begin{bmatrix} y_1 + y_2 \\ -\ln\left(\frac{x}{y_2}\right) - 2\sqrt{x+4} \end{bmatrix} \quad Y(-2) = \begin{bmatrix} 1 \\ -3 \end{bmatrix}.$$

- (a) Find a domain G where the conditions of existence and uniqueness of the solution are satisfied.
- (b) Choose step-size $h = 0.5$ and using explicit Euler method compute the approximate value of $Y(-1.5)$.
- (c) Choose step-size $h = 0.5$ and write down the system of equations from which the approximate value of $Y(-1.5)$ would be computed using implicit Euler method (do not solve the system).
- (d) Choose step-size $h = 0.5$ and using the midpoint method compute the approximate value of $Y(-1.5)$.