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Advanced Methods for ODEs and DAEs: Assignment 2

Exercise 1:

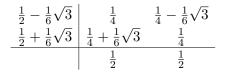
(36 points)

Consider solving an ODE of a Dahlquist problem

$$\frac{dx}{dt} = \beta x \tag{1}$$

with $\beta = -1, x(0) = 1$.

Write a Python class to solve the ODE (1) by a 2-stage Gauss-Legendre Runge Kutta method. The Butcher's array is given below.



You can base your work on the Python class in the last exercise, and build a new class for the Gauss-Legendre RK method by adding the needed implicit features.

Run the program to get the solution for a sufficient length of time period, and plot the x(t) curve.