Numerical Method Documentation

1. Variable

a. Global scope

h = the distance of current x to another, denoted by Δx

n = number of iteration

x_0 = initial value of x

y_0 = initial value of y

X = an array of cumulative sum of h from 2 to n with x0 as the first element

$$X_i = X_{i-1} + h, \quad i = 2, 3, 4 \ldots, n$$

ImprovedEuler = an array that contains value of y from improved euler method

Euler = an array that contains value of y from euler method

RungeKutta = an array that contains value of y from runge-kutta method

ExactSolution = an array that contains value of y from general solution function

2. Function

f(x, y) = F(x, y) of the differential equation

eulerMethod(Y, X, h, i) = euler method

improvedEulerMethod(Y, h, X, i) = improved euler method

exactSolution(x) = exact solution of the equation

rungeKutta(X, Y, i, h) = runge-kutta method

assign(h, x0, n) = to assign the value of *X* (global scope) as explained above

display(ImprovedEuler, ExactSol, Euler, X, n) = to display the numerical result of each method

explanation of parameters above functions used :

Y = holds an array of euler method (for ex : you pass *Euler* (global scope) to this argument)

X = holds an array of X (the X of the global scope)

h = holds the value of Δx

i = holds value of index of both array X and Y

ExactSol = holds an array of exact solution

Euler = holds an array of euler method solution

ImprovedEuler = holds an array of improved euler method solution

n = number of iteration

the rest of unexplained code are just for plotting manner, see detail explanation at : Matplotlib — Visualization with Python