MATLAB: Assignment 5

Instructions

- Once you have completed the problem, generate a pdf file with the results using the **Publish** option in matlab. **Please give me a hard copy of the pdf file.**
- **Failure to follow these instructions will result in loss points (up to the full amount of the homework total).**

Due on Monday, August 5th in class

In this exercise, you will write MATALB scripts to approximate an initial value problem using the **Euler and Runge-Kutta methods (RK2 and RK4)**.

Problem 1

Use **Euler method** with $n = 20$ to approximate the solution of the following IVP:

$$\frac{dy}{dt} = t^2(2 + y), \quad y(0) = 1, \quad 0 \leq t \leq 1.$$

Plot the points (t_i, y_i) obtained by the Euler method for each $n = 20$ value. Also in the same figure, plot the actual solution (to solve the IVP analytically, please refer your MAT 239 notes). Explain steps by commenting on them.

Problem 2

Use **Modified Euler method** with $n = 20$ to approximate the solution of the following IVP:

$$\frac{dy}{dt} = t^2(2 + y), \quad y(0) = 1, \quad 0 \leq t \leq 1.$$

Plot the points (t_i, y_i) obtained by the Modified Euler method for each $n = 20$ value. Also in the same figure, plot the actual solution (to solve the IVP analytically, please refer your MAT 239 notes). Explain steps by commenting on them.

Problem 3

Use **4th order Runge-Kutta method** with $n = 20$ to approximate the solution of the following IVP:

$$\frac{dy}{dt} = t^2(2 + y), \quad y(0) = 1, \quad 0 \leq t \leq 1.$$

Plot the points (t_i, y_i) obtained by the RK4 method for each $n = 20$ value. Also in the same figure, plot the actual solution (to solve the IVP analytically, please refer your MAT 239 notes). Explain steps by commenting on them.