

MA 448 – Classwork #2
Numerical Methods for Initial Value Problems
Due: 09/24/2019

- 1.** Write a code in Matlab/Python to implement the Classical RK4 method for Initial Value Problems (IVP) of the form:

$$\begin{aligned}y'(t) &= f(t, y(t)), \quad t_0 < t < t_{\max} \\ y(t_0) &= y_0\end{aligned}$$

Your code should print out the input data, and then the pairs: t_n, Y_n for every time step n .

- 2.** To debug your code, test the IVP

$$y'(t) = (2 - t)y, \quad y(2) = 1$$

whose exact solution is $y = e^{-\frac{1}{2}(t-2)^2}$.

- 3.** By solving an appropriate IVP, make a table of the function

$$f(x) = \frac{2}{\sqrt{\pi}} \int_0^x e^{-t^2} dt$$

on the interval $0 \leq x \leq 2$.

- 4.** Submit the following thru your course Canvas.

- (a) your code (zip for all .m-files or .py-files into lab2.zip)
 - (b) the graphical output from **2** for $n = 20$ in a single plot with appropriate labels and title.
 - (c) the text output from **3** for errors at $f(2)$ with $n = 10, 50, 100, 500, 1000$
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