MA 448 – Lab #3
Solving Systems of ODEs in Matlab/Python
Due: 10/01/2019

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1. Write a code in Matlab/Python to implement the RKF45 method to solve the following system of ODEs.

(1)
$$\begin{cases} x'(t) = x(t) - y(t) + 2t - t^2 - t^3 \\ y'(t) = x(t) + y(t) - 4t^2 + t^3 \end{cases} \qquad 0 \le t \le 1$$

with the initial conditions $x(0) = 1$ and $y(0) = 0$. Note that exact solution for this system is

$$x(t) = e^t \cos t + t^2$$
$$y(t) = e^t \sin t - t^3$$

2. Use the Matlab's ODE solver `ode45` or SciPy ODE solver `solve_ivp` to solve the initial value problem of (1).

3. Compare the results from your RKF45 code and `ode45` (or `solve_ivp` with `method="RK45"`) by plotting the numerical solutions and the exact solution together with appropriate labels and title.

4. Submit your code and the graphical output (lab3.zip) the following thru your course Canvas.