School of Engineering
University of California, Merced

ME135 – Finite Element Analysis Lab.
Spring 2018

Assignment #1 due to Monday February 5,2018

1. In one of the engineering applications the relation of x and y is given by:

$$\frac{dy}{dx} = 4e^{0.8x} - 0.5y \quad , \qquad y(0) = 2$$

Solve the equation above for $0 \leq x \leq 2$ using:

- Euler's Method.
- Modified Euler's Method.
- 4th order Runge-Kutta Method.

Use MATLAB code for the solution and plot the solutions on the same graph for comparison, use a step size of 0.01.

2. A metal sphere at temperature of 1200k radiates heat to the surroundings (300k). If the ball started radiation at time $t = 0$, the temperature of the ball with time is given by:

$$\frac{d\theta}{dt} = -2.2067 \times 10^{-12}(\theta^4 - 81 \times 10^8) \quad , \qquad \theta(t = 0) = 1200$$

where: $\boldsymbol{\theta}$ is the temperature in Kelvin and **t** is the time in seconds.

Use 4th order Runge-Kutta method and ODE45 to find the ball temperature after 480 seconds of starting the process.
Compare between the results from the two methods.

Please submit your solutions **online (CatCourses)**, the MATLAB code and the results using m-file or PDF format.