Thursday, 14 November 2019

Assignment 5

Pradeep Nag

Software Used :- Matlab *Roll:-B17133*

Solution 01.

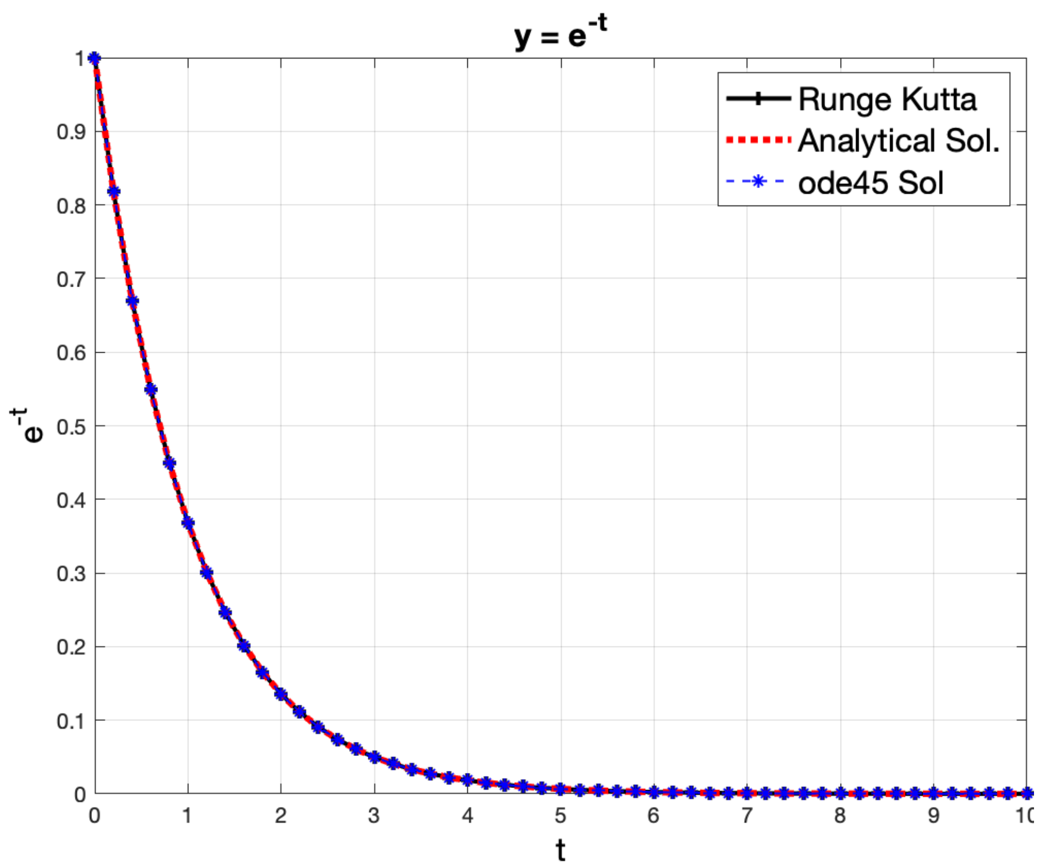
Given differential Equation with Initial values is:

$$\frac{dy}{dx} = -y \qquad y(0) = 1 \qquad 0 < t < 10$$

This Equation is solved using Runge Kutta Method of order 4 and inbuilt $ode45$ solver. The Solution of the Differential Equation is

$$y_{anal} = e^{-t}$$

These 3 Solution were plated as shown below:



Thursday, 14 November 2019

Sol. 02)

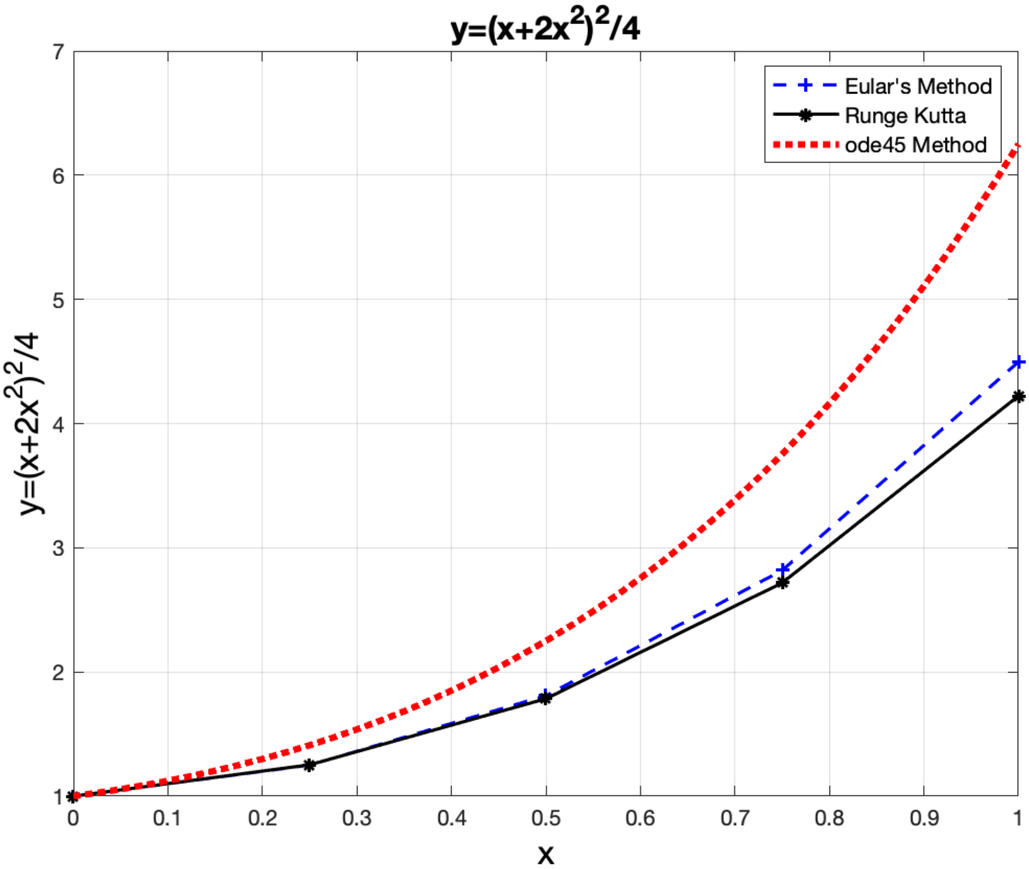
Given differential Equation with Initial values is:

$$\frac{dy}{dx} = (1+4x)\sqrt{y} \qquad y(0) = 1 \quad \textit{from } x = 0 \textit{ to } 1$$

This Equation is solved using Euler's method, Runge Kutta Method of order 4 and built-in function $ode45$ solver.

The Solution of the Differential Equation is

$$y = \frac{(x+2x^2)^2}{4}$$



Learning:- $ode45$ Solver Gives accurate solution of Differential Equation but Eulaer"s and Runge Kutta methods Fails to give accurate solution because the step size is large as $h = 0.25$. because of this only 4 points were taken to Solve the Differential equation, if we take smaller values of h like $h = 0.1$ or 0.05, we get accurate solution.

Thursday, 14 November 2019

Sol. 03)

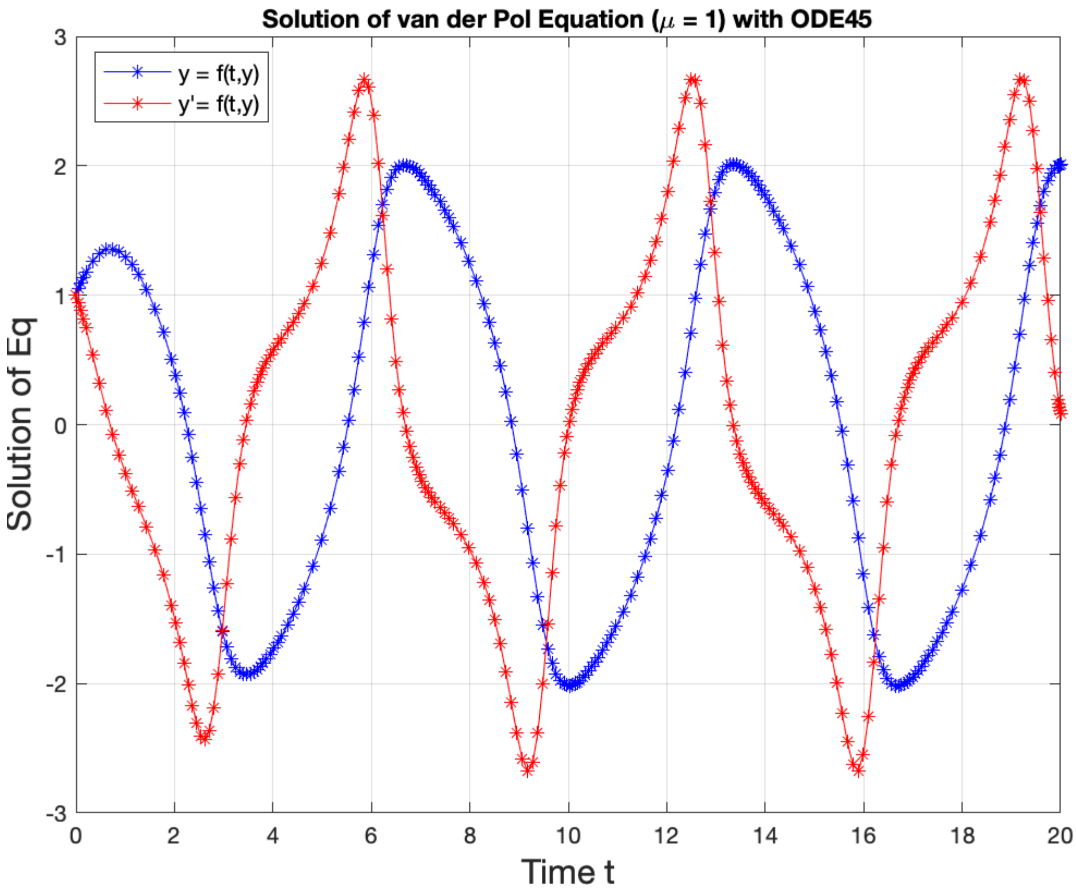
Vander po equation is ;

$$\frac{d^2y}{dt^2} - u(1-y^2)\frac{dy}{dt} + y = 0$$

Initial conditions are $y(0) = \frac{dy}{dt}(t=0) = 1$

This equation is solved :-

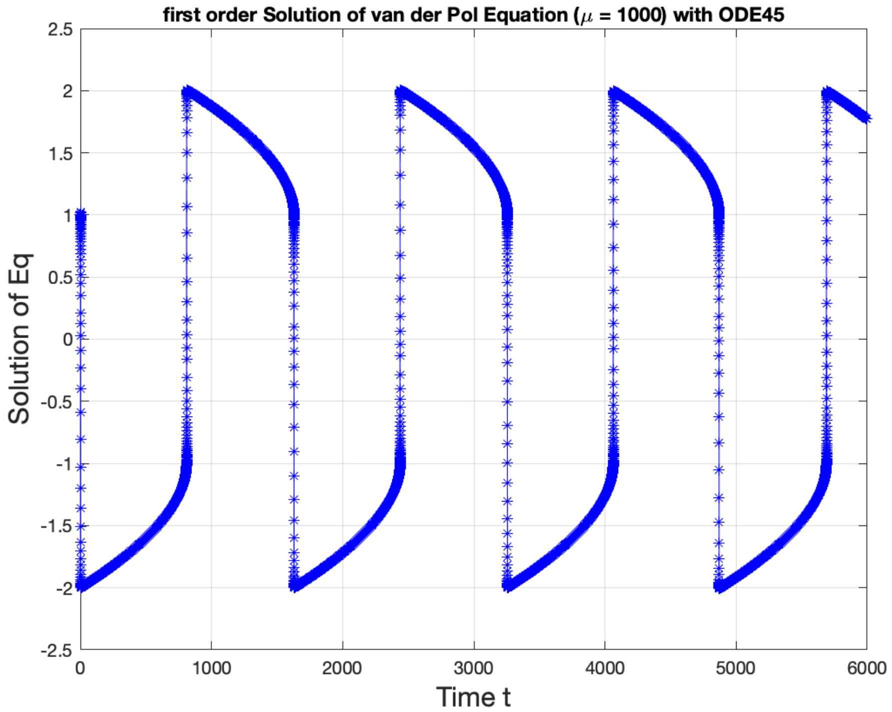
a). for $u = 1$ *from* $t = 0$ *to* 20 *using* $ode45$ *solver . here is the Plot*



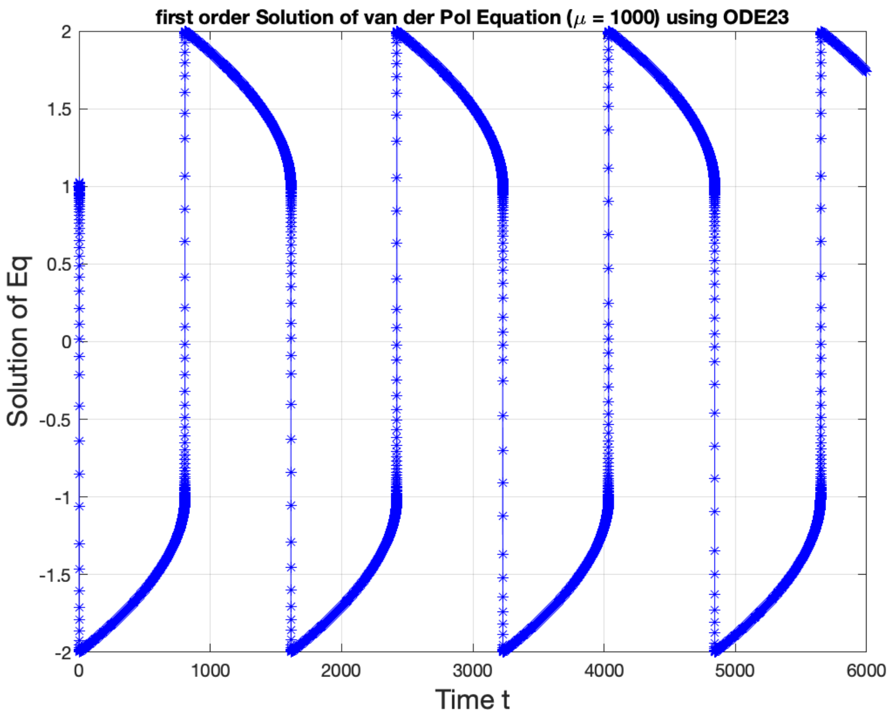
Thursday, 14 November 2019

b). for $u = 1000$ *from* $t = 0$ *to* 6000

Using $ode45$ *Solver*



Using $ode23$ *solver .*



Thursday, 14 November 2019

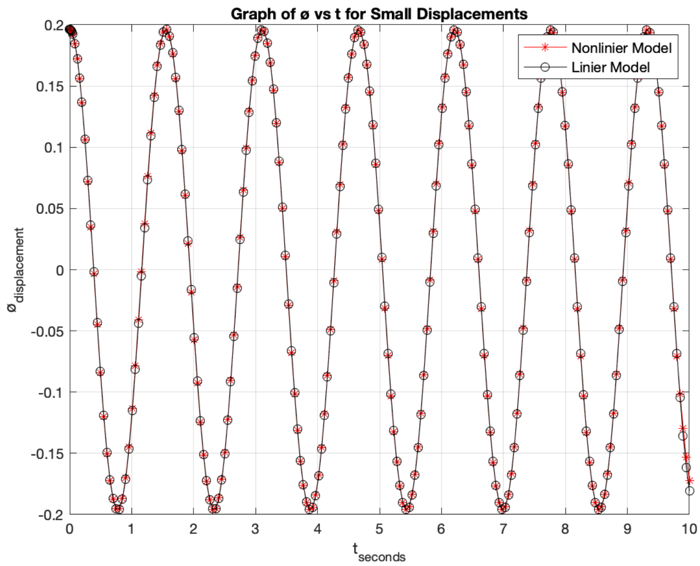
Solution. 04)

Given non-linear and linear differential equations of moving pendulum are :-

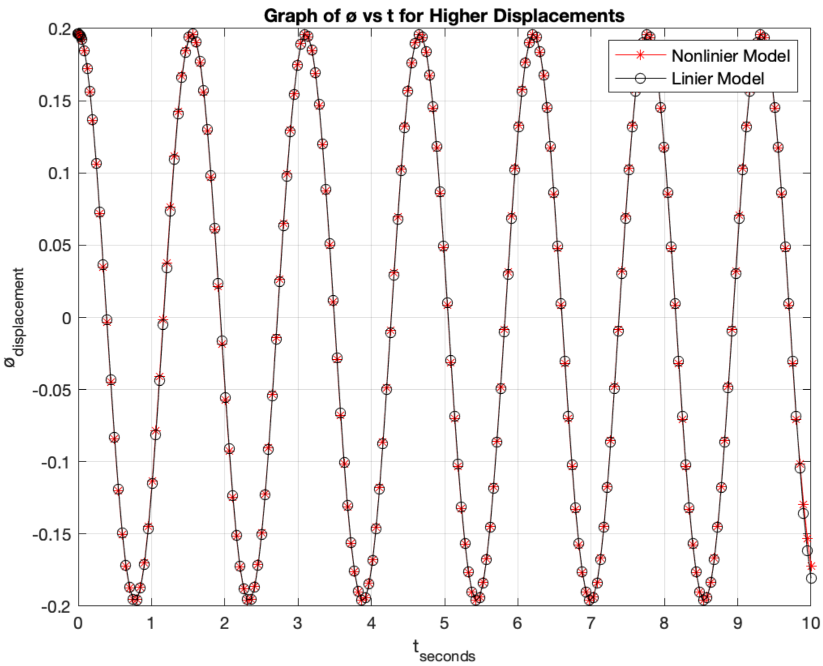
$$\frac{d\theta}{dt} + \frac{g}{l}\sin(\theta) = 0 \quad \textit{and} \quad \frac{d\theta}{dt} + \frac{g}{l}\theta = 0$$

both of these equations are solved for given initial conditions:-

a) *for small displacements* $\theta = \frac{\pi}{16}$ *and* $\frac{d\theta}{dt} = 0$



b) *for large displacements* $\theta = \frac{\pi}{2}$ *and* $\frac{d\theta}{dt} = 0$



Thursday, 14 November 2019

Sol 05)

Given differential Equation of beam is

$$\frac{d^2y}{dx^2} = \frac{wLx}{2EI} + \frac{wx^2}{2EI}$$

This Differential Equation is Solved using Finite Difference Method for diffrent Midpoints $n = 3$ *and 100 and 1000*

Analytical Solution of given Differential equation is

$$y_{analy} = -\frac{wx^4}{24EI} + \frac{wlx^3}{12EI} + \frac{wl^3x}{24EI}$$

Here are the 4 Plots