Assignment#8

1. Using **Euler's method**, find an approximate value of y when x = 0.6 of $\frac{dy}{dx} = 1 - 2xy$, given that y = 0 when x = 0 (take h = 0.2). **[0.4748]**
2. Given y' = x + sin(x), y(0) = 1. Compute y(0.2) and y(0.4) with h = 0.2 using **Euler's modified method**. **[y(0.2) = 1.2046, y(0.4) = 1.4644]**
3. Given that $\frac{dy}{dx} = 2 + \sqrt{(xy)}, y(1) = 1$. Find approximate value of y at x = 2 in steps of 0.2, using **Euler's modified method**. **[5.051]**
4. Use classical RK method to estimate y(0.5) of the following equations with h = 0.25
   a. $\frac{dy}{dx} = y + \sin(x), y(0) = 2$ b. $\frac{dy}{dx} = y + |\sqrt{y}|, y(0) = 1$
5. Solve the following equation by Heun's method for y(0.2):

   $10\frac{d^2y}{dx^2} + (\frac{dy}{dx})^2 + 6x = 0$; y(0) = 1, y'(0) = 0

6. Solve the pair of Simultaneous equations to estimate $y_1(0.5)$, $y_2(0.5)$ using any method of your choice:

   $\frac{dy_1}{dx} = y_2, y_1(0) = 2; \frac{dy_2}{dx} = -2y_2 - 5y_1, y_2(0) = 2;$

7. The general equation relating to current I, voltage V, resistance R and Inductance L of a serial electrical circuit is given by

   $$L\frac{di}{dt} + \text{iR} = \text{V}$$

   Find the value of current after 2 sec, if R = 20Ω, L = 50H, V = 240 volts. & i = 0 when t = 0.

8. A body of mass 2kg is attached to a spring with a spring constant of 10. The differential equation governing the displacement of the body 'y' and time 't' is given by

   $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 5y = 0;$

   Find the displacement y at t = 1.5, given that y(0) = 2 and y'(0) = -4.

9. Solve the equation y" = e^x + 2y'-y with the boundary conditions y(0) = 1.5 & y(2) = 2.5.
10. Apply shooting method to solve the boundary value problem:

    $\frac{d^2y}{dx^2} = y, y(0) = 0 \ \& \ y(1) = 1.1752;$

    Taking M1 = 0.8, M2 = 0.9, we get M = 0.9998 & y(1) = 1.174

11. Solve the boundary value problem for x = 0.5:

    $\frac{d^2y}{dx^2} + y + 1 = 0, y(0) = y(1) = 0$; (Take n = 4)

12. Find an approximate solution of the boundary value problem:

    y" + 8($\sin^2\pi$y)y = 0, 0≤x≤1, y(0) = y(1) = 1. (Take n = 4)