1.7 EXERCISES

1. Use Taylor's method for two steps to compute y(0.2) and y(0.4) of $y' = 1 - 2xy,\ y(0) = 0$.

2. Find y at $x = 0.1$ and 0.2 of $y' + y + xy^2 = 0,\ y(0) = 1$, and find truncation error, using Runge-Kutta fourth order method.

3. Use Taylor's method to find the value of y at $x = 0.1$ and $x = 0.2$, and truncation error of $y' - 2y = 3e^x$where $y(0) = 0$.

4. Given $y' = x^3 + y,\ y(0) = 2$, compute $y(0.2)$ and $y(0.4)$ using the Runge Kutta method of fourth order.

5. Use Taylor's method to compute $y(1.1)$ and $y(1.2)$ of $y' = x\,y^{\frac{1}{3}},\ y(1) = 1$.

6. Use Rnage-Kutta fourth order to find the approximate solution $y(0.2)$ and $y(0.4)$ of $y' = \frac{y^2-x^2}{y^2+x^2},\ \ y(0) = 1$.

7. Use Taylor method to solve $\frac{dy}{dx} = 2\,y + 3e^x,\ \ y(0) = 0$ for $x = 0.1$, $x = 0.2$.

8. Use Euler and Modified Euler to find approximate solution of y at $x = 0.2$ for $y' = 2 + \sqrt{x\,y}$, $y(1) = 1$, only two steps.

9. Find the second Taylor polynomial $P_2(x)$ for the function $f(x) = x\,e^x + x$, about $x_0 = 0$, and then find a bound for the error on the interval $[0, 1]$.

10. Find the fourth order Taylor series method for the function $y' + 4y = x^2$, with $y(0) = 1$, and then determine $y(0.4)$.

11. Use Euler's method to approximate the solution of the following initial value problem.
$$y' = x\,e^{3x} - 2y,\ 0 \le x \le 1,\ y(0) = 0, \quad \text{with } \ h = 0.5.$$

12. Use Runge-Kutta second order to find the approximate solution $0 \le t \le 0.5,\ h = 0.1$ of $y' = t^2 - y + 1,\ \ y(0) = 1$.

EXERCISES

1- Solve the boundary value problems defined by

$$y''-y=0, \quad y(0)=0, y(1)=1,$$

by finite differenc, take h=0.5

2- Solve this boundary value problem by finite difference method, where h=0.25,

$$y''+y=1, \ y(0)=0, \ y(\pi/2)=0.$$

3- Solve this boundary value problem by finite difference method, where $h=\pi/2$,

$$y''+y=\sin(2x), \quad y(0)=0, \quad y(\pi)=0.$$

4- Let y = y(x) be a solution to the boundary value problem

$$3y''+ 4y'+5y=7,$$

$$y(0) = 2, y(1.5) = 2.$$

Using a mesh width of h = 0.5. find y(0.5).

5- Let y = y(x) be a solution to the boundary value problem

$$y''+ 2y'-2y=-3,$$

$$y(0) = 1, y(2) = -2.$$

Using a mesh width of h = 0.5. find y(1).