Department of Mathematical and Computational Sciences
National Institute of Technology Karnataka, Surathkal
Numerical Analysis - MA 704
Problem Sheet 9

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1. Apply Euler method to the following initial value problem choosing $h = 0.2$. $y' = x + y, y(0) = 0$. Compute $y(0.2)$ and improve the solution by applying Euler modified method.
2. Given $y' = x + y^2, y(0) = 1$. Runge Kutta method of order 4 is used to find an approximate value of y at $x = 0.1$ using steplength $h = 0.1$. The following values of k's are computed $k_1 = 0.10000, k_2 = 0.1152$. Compute $y(0.1)$.
3. Given $y' = x - y^2$ and the follwing values of x and y

x	0.0	0.2	0.4	0.6
y	0.0000	0.0200	0.0795	0.1762

   Apply Milnes Predictor. Corrector method to find the solution at $x = 0.8$
4. Given $y' = \frac{1}{2}xy$ and the following values of x and y

x	0.0	0.1	0.2	0.3
y	1.0000	1.0025	1.0101	1.0228

   Determine $y(0.4)$ usin Adams Bashforth formula. Improve the solution using Adam-Moulton formula.
5. Given $y'' = x^3y' + y, y(0) = 1, y'(0) = 1/2$. Write down the equivalent set of two first order equations. Apply Taylor series method of order 3, to detemine y at $x = 0.2$ using $h = 0.2$.
6. Apply Dalquist method $y'' - y = x, y(0) = 1, y'(0) = 2, h = 0.1$ to detemine $y(0.2)$.

1. $I = \int_1^3 \frac{dx}{x}$ is evlauated by trapezoidal rule with 8 strips. Estimate the error in the value of I.
2. The following are the values of $I = \int_{1.8}^{3.4} e^x dx$ obtained by applying Trapezoidal rule.

h	0.2	0.4	0.8
I	23.9944	24.2328	25.1768

   Improve the value of I using the method of extapolation.
3. Evaluate $\int_0^1 xdx$ by Gauss formula with abscissas and weights corresponding to $n = 2$ $(\pm x_i = 0.57735, w_i = 1, i = 1, 2)$
4. Evaluate $\int_0^1 \int_0^1 (x + y)dxdy$ using Simpson's $1/3$ rule with $h = k = 0.5$.
5. Give $y' = 3x + 0.5, y(0) = 1.0$, find $y(0.1)$ using Taylor series of order 4 with $h = 0.1$.
6. Apply Runge-Kutta method of order 2 to evaluate $y(0.5)$ given $y' = x + y^2, y(0) = 1.0$ taking $h = 0.5$.
7. Given $5xy' + y^2 - 2 = 0, y(4.0) = 1.0, y(4.1) = 1.009, y(4.2) = 1.0097, y(4.3)1.0143$. Apply Milnes Predictor formula to evaluate $y(4.4)$.
8. Given $y'' = xy, y(0) = 0, y'(0) = 1.0$. Reduce the equation to a system of first order initial value problems.