Program :1 Newton - Raphson Method

Question :

Find a Positive real root of $x^3-x-2=0$ using Newton - Raphson method.

AIM:

To find a positive real root of $x^3-x-2=0$ by using Newton - Raphson method.

ALGORITHM:

Step 1: Define the function $f(x) = x**3 - x - 2$

Step 2: Define the function $f_1(x) = 3*x**2 - 1$

Step 3: Get the value of x_0

Step 4: for $i = 1$ to 9

$$x_n = x_0 - \frac{f(x_0)}{f'(x_0)}$$

$$x_0 = x_n$$

Step 5: Print the value of x_n.

Program:

Output:

Result:

The real root of given non linear equation is obtained

Program : 2 Gauss - Seidal method.

Question :

Solve the system of equations $4x+y+z=1$, $x+3y+z=2$, $x+y+5z=3$, using Gauss - Seidal method.

AIM:

To find the solution of given system of equations by using Gauss - Seidal method.

ALGORITHM:

Step 1: Assign $x_0=0$, $y_0=0$, $z_0=0$

Step 2: for $i=1$ to 9

Step 3: Compute $x=\frac{1}{4}\times(1-y_0-z_0)$

Step 4: Assign $x_0=x$

Step 5: Compute $y=\frac{1}{3}*(2-x_0-z_0)$

Step 6: Assign $y_0=y$

Step 7: Compute $z=1/5\times(3-x_0-y_0)$

Step 8: Assign $z_0=z$

Step 9: Print the value of x, y, z.

Result:-

The approximate solution is obtained by using Gauss Seidal method.

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Program: 3 Lagrange's Interpolation Method.

Question:

Using Lagrange interpolation formula, find the value corresponding to $x=10$ from the following table

x	0	1	2	[illegible]	4	5	6
y	1	14	15	[illegible]	5	6	19

AIM:

To find the interpolating functional value of y at $x=10$ by using Lagrange's method.

~~PROCEDURE~~ ALGORITHM:

step 1: Get the value of x

step 2: Get the value of y

step 3: for $i = 0$ to 6

step 4: for $j = 0$ to 6

if $i != j$

$prod = prod \times (s - x[j]) / (x[i] - x[j])$

$sum = sum + prod \times y[i]$

step 5: Print the value of y

Result:

The interpolated value of y is obtained.

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Program 4: Trapezoidal rule.

Question: Evaluate $\int_0^1 \frac{dx}{1+x^2}$, using trapezoidal rule with $h=0.2$.

AIM:

To compute given definite integral by using Trapezoidal rule.

ALGORITHM:

Step 1: Define the function $f(x) = 1/(1+x**2)$

Step 2: Define the values of a, b, h..

Step 3: Compute $n=(b-a)/h$

Step 4: Assign sum = 0

for i ~~=~~ 1 to n

sum = sum + f(a + i * h)

trep = h/2 * (f(a) + f(b) + 2 * sum)

Step 5: Print the integral value.

Result:

~~The solution~~ The value of given definite integral is obtained.

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Program : 5 Runge-Kutta method of IVth order.

Question :

Find $y(0.2)$, given that $\frac{dy}{dx} = x+y^2$, $y(0) = 1$, using Runge-Kutta method.

AIM:

To find approximate solution of first order differential equation by using Runge-Kutta method.

ALGORITHM:

Step 1: Define the function $f(x, y) = x + y**2$

Step 2: Get the values of x_0, y_0, h.

Step 3 : Compute $k_1 = h * f(x_0, y_0)$

Step 4 : Compute $k_2 = h * f(x_0+h/2, y_0+k_1/2)$

Step 5 : Compute $k_3 = h * f(x_0+h/2, y_0+k_2/2)$

Step 6 : Compute $k_4 = h * f(x_0+h, y_0+k_3)$

Step 7 : Compute $y = y_0 + (k_1+2*k_2+2*k_3+k_4)/6$

Step 8 : Print the value of y.

Result:

The solution of first order equation is obtained by using Runge Kutta method.

Program: 6 Adams predictor and corrector method

Question:

Evaluate $y(1.4)$, given that $\frac{dy}{dx} = x^2(1+y)$, $y(1) = 1$, $y(1.1) = 1.233$, $y(1.2) = 1.548$ and $y(1.3) = 1.979$ using Adams predictor and corrector method.

AIM:

To find approximate solution of first order differential equation by using Adams predictor and corrector method.

ALGORITHM:

Step 1: Define the function $f(x,y) = (x**2)*(1+y)$

Step 2: Get the values of $x_0, y_0, x_1, y_1, x_2, y_2, x_3$ and y_3.

Step 3: Compute $h = x_1 - x_0$

Step 4: Compute $y_{4,p} = y_3 + (h/24) * (55 * f(x_3, y_3) - 59 * f(x_2, y_2) + 37 * f(x_1, y_1) - 9 * f(x_0, y_0))$

$x_4 = x_3 + h$

Step 5: Compute $y_{4c} = y_3 + (h/24) * (9 * f(x_4, y_{4p}) + 19 * f(x_3, y_3) - 5 * f(x_2, y_2) + f(x_1, y_1))$

Step 6: Print the value of $y_{4,c}$.

Result:

The solution of first order differential equation is obtained by using Adam's predictor & corrector method.