Assignment:

"Scientific Computation"

Name: Raheel Javed

Reg. No: 2009-EE-105

Section: B

Assignment Problem:

Write a matlab code to find root of a given eqn using muller method and show output as well as plot of approximate error for both methods.

Muller Method:

Following code is used to calculate root of a function using muller method. It also plot iteration vs approximate error graph.

```
% x0, x1, x2 are three initial guesses.
% eps defines the expected value of approximate error you want.
% maxit is the max no. of iterations you want to perform.

function root=muller(x0, x1, x2, eps, maxit)
iter=0;
i=0;
fprintf('MULLER METHOD\n');
while(1)
    i=i+1;
    fprintf('Iteration No. %d:\n', i);
    iter(i)=i;
    h0=x1-x0;
    h1=x2-x1;
    d0=(f(x1)-f(x0))/h0;
    d1=(f(x2)-f(x1))/h1;
    a=(d1-d0)/(h1+h0);
    b=a*h1+d1;
    c=f(x2);
    rad=sqrt(b*b-4*a*c);
    if(abs(b+rad)>abs(b-rad))
        den=b+rad;
    else
        den=b-rad;
    end
    dxr=-2*c/den;
    xr=x2+dxr
    ea(i)=abs(dxr/xr)*100;
    error=ea(i)
    if (abs(dxr)<eps*xr || iter(i)>=maxit)
        break;
    end
    x0=x1;
    x1=x2;
    x2=xr;
end
root=xr;
plot(iter, ea)
grid
title('Approximate Error Plot Of Muller Method')
xlabel('Iterations')
ylabel('% ea')
pause
end
```

Function and Its Outputs:

The eqn whose roots are to be found should be defined as a function in new m.file named f. Then the function "muller" should be called with proper arguments.

```
function y=f(x)
y=x^3-13*x-12;

muller(4.5, 5.5, 5, 0.005, 5)

MULLER METHOD

Iteration No. 1:
xr = 3.9765
error = 25.7391

Iteration No. 2:
xr = 4.0011
error = 0.6139

Iteration No. 3:
xr =  4.0000
error =  0.0262

Iteration No. 4:
xr = 4.0000
error = 1.7632e-005

root = 4.0000
```