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COMPUTATIONAL METHODS LAB
PRACTICAL FILE
PAPER CODE : ES-251

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(MATHS)

EXPERIMENT - 1

Aim:- To find the root of equation using Newton Raphson Method

Code:-

```
#include<iostream>

#include<iomanip>

#include<cmath>

using namespace std;

float f(float x){

return x*log10(x)-1.2;

}

float df(float x){

return log10(x)+0.43429;

}

int main(){

int itr, maxitr;

float h, x0, x1, aerr;

cout<<"Enter x0, allowed error, maximum iterations"<<endl;

cin>>x0>>aerr>>maxitr;

cout<<fixed;
```

```

for(itr=1;itr<=maxitr;itr++){
h=f(x0)/df(x0);
x1=x0-h;
cout<<"Iteration no. "<<setw(3)<<itr;
cout<<"X="<<setw(9)<<setprecision(6);
cout<<x1<<endl;
if(fabs(h)<aerr){
cout<<"After no. "<<setw(3)<<itr;
cout<<" Iteration, root=";
cout<<setw(8)<<setprecision(6)<<x1;
return 0;
}
x0=x1;
}

cout<<"Iteration not sufficient, ";
cout<<"solution does not converge"<<endl;

```

```
return 1;
```

```
}
```

OUTPUT:-

```
Enter x0, allowed error, maximum iterations
2 .000001 10
Iteration no. 1X= 2.813170
Iteration no. 2X= 2.741109
Iteration no. 3X= 2.740646
Iteration no. 4X= 2.740646
After no. 4 Iteration, root=2.740646

..Program finished with exit code 0
Press ENTER to exit console.[]
```

EXPERIMENT - 2

Aim:- To find the root of equation using Bisection Method

Code:-

```
#include <iostream>

#include <math.h>

using namespace std;

float fn(float x){
    return pow(x,2)+(3*x)+1 ;
}

int main(){ float a,b,e=0,z;

    cout<<"Enter Numbers";

    cin>>a>>b;

    z=(a+b)/2;

    do{ z=(a+b)/2;

        e++;

        if ( (fn(a)* fn(b)) <= 0 ){

            if (fn(z)>0 && fn(a)>0)

                a=z;

            else if (fn(z)>0 && fn(b)>0)

                b=z;
```

```
    else if (fn(z)<0 && fn(a)<0)
        a=z;
    else if (fn(z)<0 && fn(b)<0)
        b=z;
    cout<<"The iterative "<<e<<" root is "<<z;
    cout<<endl;
}
else
    cout<<"Enter again";
}
while(abs(fn(z))>0.0001);
return 0;
}
```

OUTPUT:-

```
Enter Numbers1
-1
The iterative 1 root is 0
The iterative 2 root is -0.5
The iterative 3 root is -0.25
The iterative 4 root is -0.375
The iterative 5 root is -0.4375
The iterative 6 root is -0.40625
The iterative 7 root is -0.390625
The iterative 8 root is -0.382812
The iterative 9 root is -0.378906
The iterative 10 root is -0.380859
The iterative 11 root is -0.381836
The iterative 12 root is -0.382324
The iterative 13 root is -0.38208
The iterative 14 root is -0.381958
```

EXPERIMENT - 3

Aim:- To find the root of equation using Secant Method

Code:-

```
#include<iostream>

#include<iomanip>

#include<math.h>

#include<stdlib.h>

#define f(x) x*x*x - 2*x - 5

using namespace std;

int main(){

float x0, x1, x2, f0, f1, f2, e;

int step = 1, N;

cout<< setprecision(6)<< fixed;

cout<<"Enter first guess: ";

cin>>x0;

cout<<"Enter second guess: ";

cin>>x1;

cout<<"Enter tolerable error: ";

cin>>e;

cout<<"Enter maximum iteration: ";
```



```

cin>>N;

cout<< endl<<"*****"<< endl;

cout<<"Secant Method"<< endl;

cout<<"*****"<< endl;

do {

    f0 = f(x0);

    f1 = f(x1);

    if(f0 == f1){

        cout<<"Mathematical Error.";

        exit(0);

    }

    x2 = x1 - (x1 - x0) * f1/(f1-f0);

    f2 = f(x2);

    cout<<"Iteration-"<< step<<":\t x2 = "<< setw(10)<< x2<<" and f(x2) = "<<
    setw(10)<< f(x2)<< endl;

    x0 = x1;

    f0 = f1;

    x1 = x2;

    f1 = f2;

    step = step + 1;

    if(step > N){

```

```

cout<<"Not Convergent.";

exit(0);

}

}while(fabs(f2)>e);

cout<< endl<<"Root is: "<< x2;

return 0;

}

```

OUTPUT:-

```

Enter first guess: 0
Enter second guess: 1
Enter tolerable error: 0.000001
Enter maximum iteration: 10

*****
Secant Method
*****
Iteration-1:    x2 =  -5.000000 and f(x2) = -120.000000
Iteration-2:    x2 =   1.315790 and f(x2) =  -5.353549
Iteration-3:    x2 =   1.610713 and f(x2) =  -4.042599
Iteration-4:    x2 =   2.520172 and f(x2) =   5.965942
Iteration-5:    x2 =   1.978057 and f(x2) =  -1.216551
Iteration-6:    x2 =   2.069879 and f(x2) =  -0.271569
Iteration-7:    x2 =   2.096267 and f(x2) =   0.019166
Iteration-8:    x2 =   2.094527 and f(x2) =  -0.000268
Iteration-9:    x2 =   2.094551 and f(x2) =  -0.000002
Iteration-10:   x2 =   2.094552 and f(x2) =   0.000001
Not Convergent.

```

