Nonlinear Equation Solving

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摘要

This is a report about solving non-linear equation using bisection method,Newton's method and secant method.

1 B

Input：

```
//Question B(i)
 BisectionMethod Bis1;
 Bis1.seta(0);
 Bis1.setb(pi/2);
 string a="func_1";
 Bis1.setfun(a);

 cout<<"B(i).The value of root is:"<<Bis1.Solve()<<endl;


 //Question B(ii)
 BisectionMethod Bis2;
 Bis2.seta(0);
 Bis2.setb(1);
 string b="func_2";
 Bis2.setfun(b);

 cout<<"B(ii).The value of root is:"<<Bis2.Solve()<<endl;
```

```
//Question B(iii)
BisectionMethod Bis3;
Bis3.seta(1);
Bis3.setb(3);
string c="func_3";
Bis3.setfun(c);

cout<<"B(iii).The value of root is:"<<Bis3.Solve()<<endl;


//Question B(iv)
BisectionMethod Bis4;
Bis4.seta(0);
Bis4.setb(4);
string d="func_4";
Bis4.setfun(d);

cout<<"B(iv).The value of root is:"<<Bis4.Solve()<<endl;
```

Output:

```
B(i).The value of root is:0.860276
B(ii).The value of root is:0.641174
B(iii).The value of root is:1.82941
B(iv).The value of root is:0.117859
```

2 C

Input:

```
//Question C
NewtonMethod New1;
New1.seta(4.5);
string e="func_5";
string f="derivfunc_5";
New1.setfun(e,f);

 cout<<"C(i).The value of root is:"<<New1.Solve()<<endl;

NewtonMethod New2;
New2.seta(7.7);
string w="func_5";
string u="derivfunc_5";
New2.setfun(w,u);

 cout<<"C(ii).The value of root is:"<<New2.Solve()<<endl;
```

Output:

```
C(i).The value of root is:4.49341
C(ii).The value of root is:7.72525
```

3 D

Input:

```
//Question D(i)
SecantMethod Sec1;
Sec1.seta(0);
Sec1.setb(pi/2);
string g="func_6";
Sec1.setfun(g);

cout<<"D(i).The value of root is:"<<Sec1.Solve()<<endl;

//Question D(ii)
SecantMethod Sec2;
Sec2.seta(1);
Sec2.setb(1.4);
string h="func_7";
Sec2.setfun(h);

cout<<"D(ii).The value of root is:"<<Sec2.Solve()<<endl;

//Question D(iii)
SecantMethod Sec3;
Sec3.seta(0);
Sec3.setb(-0.5);
string i="func_8";
Sec3.setfun(i);

cout<<"D(iii).The value of root is:"<<Sec3.Solve()<<endl;
```

Output:

```
D(i).The value of root is:3.13427
D(ii).The value of root is:1.30633
D(iii).The value of root is:-0.188685
```

4 E

Input:

```
//Question E
//Test1
BisectionMethod Bis5;
Bis5.seta(0);
Bis5.setb(1);
string j="func_9";
Bis5.setfun(j);

cout<<"E.The depth of water(BisectionMethod) ="<<1-Bis5.Solve()<<endl;

//Test2
NewtonMethod New3;
New3.seta(0);
string k="func_9";
string l="derivfunc_9";
New3.setfun(k,l);

 cout<<"E.The depth of water(NewtonMethod) ="<<1-New3.Solve()<<endl;

 //Test3
SecantMethod Sec4;
Sec4.seta(0);
Sec4.setb(1);
string m="func_9";
Sec4.setfun(m);

cout<<"E.The depth of water(SecantMethod) ="<<1-Sec4.Solve()<<endl;
```

Output:

```
E.The depth of water(BisectionMethod) =0.833801
E.The depth of water(NewtonMethod) =0.833834
E.The depth of water(SecantMethod) =0.833834
```

5 F

Input:

```
 //Question F(a)
NewtonMethod New4;
New4.setnum(80,49,55,11.5);
New4.seta(30);
string o="func_10";
string n="derivfunc_10";
New4.setfun(o,n);
 cout<<"F(a).The value a is:"<<New4.Solve()<<endl;

 //Question F(b)
NewtonMethod New5;
New5.setnum(80,49,30,11.5);
New5.seta(33);
string p="func_10";
string q="derivfunc_10";
New5.setfun(p,q);
cout<<"F(b).The value a is:"<<New5.Solve()<<endl;

//Question F(c)
SecantMethod Sec5;
Sec5.setnum(80,49,55,11.5);
Sec5.seta(0);
Sec5.setb(50);
string r="func_10";
Sec5.setfun(r);
cout<<"F(c).The value a is:"<<Sec5.Solve()<<endl;
```

Output:

```
F(a).The value a is:32.6313
F(b).The value a is:32.5992
F(c).The value a is:-0.0785283
```