

Report of Programming Assignment

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Problem B

As shown in the chart below, the **bisection method** for the fourth equation works poor. The value of function at $x_0 = 0.116378$ (the so-called root according to **bisection method**) is extremely large. The reason is that this function actually has no root in the field of real number.

```
1.0/x-tan(x)
0.860334  0

1.0/x-pow(2.0,x)
0.641186  0

pow(2.0, -x) + exp(x) + 2.0*cos(x) - 6.0
1.82938  0

(x*x*x + 4*x*x + 3*x + 5) / (2*x*x - 9*x*x + 18*x - 2)
0.116378  6.08536e+15
```

Problem C

In Problem C, I use the derivative function for this specific question instead of the **differential quotient method** to find the derivatives in order to make it more precisely.

```
class Func : public Function{
public:
    double operator () (const double &x) const{
        return x-tan(x);
    }
    double diff (const double &x) const{
        return 1 - 1.0/(cos(x)*cos(x)); //用了数学意义上的导函数而非差商计算
    }
} f;
```

The result is proved good.

```
The root near 4.5 is 4.49341
The root near 7.7 is 7.72525
```

Problem D

The secant method works well in all three functions.

$\sin(x/2) - 1.0$

The root is 3.14159 and the value of the function is $-1.11022e-16$

$\exp(x) - \tan(x)$

The root is 1.30633 and the value of the function is $-4.44089e-16$

$x^3 - 12x^2 + 3x + 1$

The root is -0.188685 and the value of the function is 0

Problem E

(Bisection Method) The depth of water is 0.833845

(Newton Method) The depth of water is 0.832031

(Secant Method) The depth of water is 0.83377

Problem F

When the angle = 33, the scant value cannot approach the tangent value. Then the result is not right.

function: $17.7437 \sin(x) \cos(x) + 87.2133 \sin(x) \sin(x) - 9.65671 \cos(x) - 47.4642 \sin(x)$

ans = 32.9722 degrees

function: $17.7437 \sin(x) \cos(x) + 87.2133 \sin(x) \sin(x) - 9.70776 \cos(x) - 47.7152 \sin(x)$

ans = 33.1689 degrees

function: $17.7437 \sin(x) \cos(x) + 87.2133 \sin(x) \sin(x) - 9.65671 \cos(x) - 47.4642 \sin(x)$

initial value = 45.0 degrees, ans = 32.9722 degrees

initial value = 5.0 degrees, ans = -11.5 degrees

initial value = 111.0 degrees, ans = 147.028 degrees