

## 1. Experimental tasks and requirements:

1) Write a function that computes  $\sqrt{1-x^2}$ . Note that the value range of the independent variable is  $[-1,1]$ .

2) Write a function that computes the sine of  $x$ .

3) Write an integral function to calculate the definite integral of a one-variable function in a given interval. Require:

A. Pass the integral interval  $[a,b]$  and the integrand as parameters to the integral function.

B. The integrand is passed to the integral function with a function pointer.

C. The function returns the value of the definite integral.

4) Requirements:

A. Output your name and student number in the main function (output on the same line, and change the line after the output).

B. Calculate the definite integral for the functions defined in 1) and 2) above;

Among them, the integral interval of the first integrand is  $[-1,1]$  and  $[-2,1],[0,1]$ ;

The integration interval of the second integrand uses the following:  $[-\pi,\pi],[0,\pi],[0,\pi/2]$ . ( $\pi=3.14159265$ )

C. For each integrand and integral interval, output the corresponding integral interval and integral value

5) Submissions include:

A. For this experiment report, please replace ##### in the file name of the experiment report with your student number, and replace X XX with your name.

B. Source code. The above functions are written in the same source file, and the source file naming rule is C PP-2-#####.cpp, where ##### is replaced by your student number.

**2. Paste the screenshot of the program running result below. (If the executable file cannot be generated due to grammatical errors, there will be no running results, and the screenshot will not be pasted)**

```
function 1:f(x)=sqrt(1-x^2)

y=1.5708  section:[-1,1]
y=1.5708  section:[-2,1]
y=0.785398  section:[0,1]

function 2:f(x)=sin(x)

y=9.52889e-14  section:[-PI,PI]
y=2  section:[0,PI]
y=1  section:[0,PI/2]

请按任意键继续. . .
```

**3. Insert your completed source file below . (Insert method: first place the cursor at the beginning of the next paragraph of this paragraph, then select Insert->Object->Text in the file in the menu bar, and select the source file you wrote in the pop-up dialog box )**

```
#include <iostream>
#include <cmath>
#define DIV 1e7
#define PI 3.14159265
using namespace std;
typedef double(*Fn)(double);

double sqrt_func(double x) //The integrand function 1 of this question: f(x)=sqrt(1
- x * x)
{
    if (x >= -1 && x <= 1)
        return sqrt(1 - x * x);
    else
        return 0;
}

double eva(Fn fn, double a, double b) //integral function
{
    double all = 0; // use all to achieve integral accumulation
    long long int range = (b - a) * DIV; //Abstract a total of range differential rectangles
    while (range-- > 0) //integration process (adding range rectangles)
    {
        all = all + (*fn)(a) / DIV; //differential dx join all
        a = a + 1 / DIV; // differential dx go to next position
    }
    return all;
}

int main(void)
{
    cout << "function 1:f(x)=sqrt(1-x^2)" << endl << endl; //call the integrand function
    sqrt_func()
    cout << "y=" << eva(sqrt_func, -1, 1) << "section:[-1,1]" << endl;
    cout << "y=" << eva(sqrt_func, -2, 1) << "section:[-2,1]" << endl;
    cout << "y=" << eva(sqrt_func, 0, 1) << "section:[0,1]" << endl << endl;

    cout << "function 2:f(x)=sin(x)" << endl << endl; //The following integrand directly
    calls the library function sin()
    cout << "y=" << eva(sin, -PI, PI) << "section:[-PI,PI]" << endl;
    cout << "y=" << eva(sin, 0, PI) << "section:[0,PI]" << endl;
    cout << "y=" << eva(sin, 0, PI / 2) << "section:[0,PI/2]" << endl << endl;
```

```
system("pause");  
}
```