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ОТЧЁТ ПО ЛАБОРАТОРНОЙ РАБОТЕ №8  
по дисциплине «Программирование с применением функций»

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Омск 2021

## Задача 1.

### Условие:

Написать и отладить программы для задач из лабораторных работ 1 и 6 с применением подпрограммы - функции с параметрами.

### Текст программы:

```
8_1_1.cpp x 8_1_2.cpp x 8_1_3.cpp x 8_1_4.cpp x 8_2.cpp x
1 #include <iostream>
2 #include <cmath>
3
4 double f(double a, double b, double x) {
5     double result = sqrt( std::abs( a * x * pow(sin(x), 2)) + (pow(M_E, -2 * x) * (x + b)));
6     return result;
7 }
8
9 ▶ int main() {
10     double a, b, x1, x2;
11
12     x1 = 1.0;
13     x2 = 2.0;
14     a = 0.5;
15     b = 3.1;
16
17     std::cout << "[+] F(" << a << ", " << b << ", " << x1 << "): " << f(a, b, x1) << std::endl;
18
19     std::cout << "[+] F(" << a << ", " << b << ", " << x2 << "): " << f(a, b, x2) << std::endl;
20
21     return 0;
22 }
```

```
8_1_1.cpp x 8_1_2.cpp x 8_1_3.cpp x 8_1_4.cpp x 8_2.cpp x
1 #include <iostream>
2 #include <cmath>
3
4 double f_square(double r) {
5     return M_PI * pow(r, 2);
6 }
7
8 double f_value(double r) {
9     return (4 * M_PI * pow(r, 3)) / 3;
10 }
11
12 double f_relationship(double r) {
13     return f_square(r) / f_value(r);
14 }
15
16 ▶ int main() {
17     double r;
18
19     std::cout << "[>] Enter R: ";
20     std::cin >> r;
21
22     std::cout << "[+] Square: " << f_square(r) << std::endl;
23     std::cout << "[+] Value: " << f_value(r) << std::endl;
24     std::cout << "[+] Relationship: " << f_relationship(r) << std::endl;
25
26     return 0;
27 }
```

```
8_1_1.cpp x 8_1_2.cpp x 8_1_3.cpp x 8_1_4.cpp x 8_2.cpp x
1 #include <iostream>
2
3 void sort(int array[], int size) {
4     std::cout << "[+] Sorted array: ";
5     for (int i = 0; i < size; i++) {
6         if (array[i] < 0) {
7             std::cout << array[i] << " ";
8         }
9     }
10    for (int i = 0; i < size; i++) {
11        if (array[i] >= 0) {
12            std::cout << array[i] << " ";
13        }
14    }
15    std::cout << std::endl;
16}
17
18 int main() {
19     int size = 12;
20     int array[size];
21
22     std::cout << "[>] Enter array: ";
23     for (int i = 0; i < size; i++) {
24         std::cin >> array[i];
25     }
26
27     sort(array, size);
28
29     return 0;
30}
```

```
8_1_1.cpp x 8_1_2.cpp x 8_1_3.cpp x 8_1_4.cpp x 8_2.cpp x
1 #include <iostream>
2 #include <cmath>
3
4 double f_1(double x) {
5     double result = pow(M_E, -x) * log10(x * sqrt(x + 1));
6     return result;
7 }
8
9 double f_2(double x) {
10    double result = x + sin(x);
11    return result;
12 }
13
14 int main() {
15     double start = 1;
16     double stop = 2;
17     double steps = 12;
18     double value = 1;
19     double step = (stop - start) / steps;
20
21     double f_1_results[(int)steps];
22     double f_2_results[(int)steps];
23     std::cout << "+-----+-----+-----+" << std::endl;
24     std::cout << "| Value | F(1) | F(2) |" << std::endl;
25     std::cout << "|-----+-----+-----|" << std::endl;
26     for (int i = 0; i <= steps; i++) {
27         f_1_results[i] = f_1(value);
28         f_2_results[i] = f_2(value);
29         printf(format: "| %.2f | %.2f | %.2f |\n", value, f_1_results[i], f_2_results[i]);
30         value += step;
31     }
32     std::cout << "+-----+-----+-----+" << std::endl;
33
34     return 0;
35 }
```

### Результат работы программы:

```
Run: Code_1 x
"/home/tux/Documents/Learn/0mSTU/1 Semester/AP/Labs/8/Code/cmake-build-debug/Code_1"
[+] F(0.5, 3.1, 1): 1.14988
[+] F(0.5, 3.1, 2): 1.00271
Process finished with exit code 0
```

Run: **Code\_2** ×

```
▶ Up      "/home/tux/Documents/Learn/OmSTU/1 Semester/AP/Labs/8/Code/cmake-build-debug/Code_2"
↓ Down    [>] Enter R: 12
⠇ Run    [+]
[-] Square: 452.389
[+] Value: 7238.23
[+] Relationship: 0.0625

Process finished with exit code 0
```

|

Git Run TODO Problems Terminal Python Packages CMake Messages

Run: **Code\_3** ×

```
▶ Up      "/home/tux/Documents/Learn/OmSTU/1 Semester/AP/Labs/8/Code/cmake-build-debug/Code_3"
↓ Down    [>] Enter array: 1 2 3 4 5 6 -1 -2 -3 -4 -5 -6
⠇ Run    [+]
[-] Sorted array: -1 -2 -3 -4 -5 -6 1 2 3 4 5 6

Process finished with exit code 0
```

|

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Run: **Code\_4** ×

```
▶ Up      "/home/tux/Documents/Learn/OmSTU/1 Semester/AP/Labs/8/Code/cmake-build-debug/Code_4"
↓ Down    +-----+
⠇ Run    | Value   | F(1)    | F(2)    |
[-] Print  |-----+-----+-----+
[+] Dump   | 1.00    | 0.06    | 1.84    |
[+] Dump   | 1.08    | 0.05    | 1.97    |
[+] Dump   | 1.17    | 0.05    | 2.09    |
[+] Dump   | 1.25    | 0.05    | 2.20    |
[+] Dump   | 1.33    | 0.05    | 2.31    |
[+] Dump   | 1.42    | 0.05    | 2.40    |
[+] Dump   | 1.50    | 0.04    | 2.50    |
[+] Dump   | 1.58    | 0.04    | 2.58    |
[+] Dump   | 1.67    | 0.04    | 2.66    |
[+] Dump   | 1.75    | 0.04    | 2.73    |
[+] Dump   | 1.83    | 0.04    | 2.80    |
[+] Dump   | 1.92    | 0.03    | 2.86    |
[+] Dump   | 2.00    | 0.03    | 2.91    |
+-----+-----+-----+
```

```
Process finished with exit code 0
```

|

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## Задача 2.

### Условие:

По заданным целым массивам X[8] и Y[8] вычислить.

$$\begin{cases} \sum_{i=0}^7 x_i^2, \text{ при } \sum_{i=0}^7 x_i y_{i+8} \\ \sum_{i=8}^{15} y_i^2, \text{ в противном случае} \end{cases}$$

### Текст программы:

```
8_1_1.cpp x 8_1_2.cpp x 8_1_3.cpp x 8_1_4.cpp x 8_2.cpp x
1 #include <iostream>
2 #include <cmath>
3
4 bool check(const double x[], const double y[], int size){
5     for (int i = 0; i < size; i++) {
6         if (x[i] * y[i] <= 0) {
7             return false;
8         }
9     }
10    return true;
11}
12
13 int main() {
14     int size = 8;
15     double x[size];
16     double y[size];
17
18     std::cout << "[>] Enter array X: ";
19     for (int i = 0; i < size; i++) {
20         std::cin >> x[i];
21     }
22     std::cout << "[>] Enter array Y: ";
23     for (int i = 0; i < size; i++) {
24         std::cin >> y[i];
25     }
26
27     double sum = 0;
28     if (check(x, y, size)) {
29         for (int i = 0; i < size; i++) {
30             sum += pow(x[i], y[2]);
31         }
32     } else {
33         for (int i = 0; i < size; i++) {
34             sum += pow(y[i], y[2]);
35         }
36     }
37
38     std::cout << "[+] Sum of array: " << sum << std::endl;
39
40     return 0;
41}
```

## Результат работы программы:

```
Run: Code_5 ×
▶ "/home/tux/Documents/Learn/0mSTU/1 Semester/AP/Labs/8/Code/cmake-build-debug/Code_5"
➤ Enter array X: 1 2 3 4 5 6 7 8
➤ Enter array Y: -9 -10 -11 -12 -13 -14 -15 -16
[+] Sum of array: 1292
[+]
Process finished with exit code 0
```

The screenshot shows a terminal window titled "Code\_5" with the following output:  
"/home/tux/Documents/Learn/0mSTU/1 Semester/AP/Labs/8/Code/cmake-build-debug/Code\_5"  
[>] Enter array X: 1 2 3 4 5 6 7 8  
[>] Enter array Y: -9 -10 -11 -12 -13 -14 -15 -16  
[+] Sum of array: 1292  
[+]  
Process finished with exit code 0