Лабораторная работа «Решение системы ДУ»

Постановка задачи:

Решить систему дифференциальных уравнений вида

$$\begin{cases} \frac{dx}{dy} = -2x + 5z \\ \frac{dy}{dt} = \sin(t-1)\,x - y - 3z \\ \frac{dz}{dt} = -x + 2z \end{cases}$$

С начальными условиями

x (0) = 2

y (0) = 1

z (0) = 1

Мат.модель:

$yi = h * f(x,y) + yi - 1$

Код:

```c
#include "stdafx.h"
#include <cstdio>
#include <math.h>

double f1(double x, double z) {
    return -2 * x + 5 * z;
}

double f2(double t, double x, double y, double z) {
    return sin(t - 1)* x - y - 3 * z;
}

double f3(double x, double z) {
    return -x + 2 * z;
}

int main()
{
    double x = 2, y = 1, z = 1, x1, y1, z1, h = 0.1;
    for (double i = 0; i <= 1; i += h) {
        printf("x[%1.1lf] = %1.5lf, y[%1.2lf] = %1.5lf, z[%1.2lf] = %1.5lf\n", i, x, i, y, i, z);
        x1 = x + f1(x, z) * h;
        y1 = y + f2(i, x, y, z) * h;
        z1 = z + f3(x, y) * h;
        x = x1;
        y = y1;
        z = z1;
    }
    getchar();
    return 0;
}
```

Результат выполнения:

```
x[0.0] = 2.00000, y[0.00] = 1.00000, z[0.00] = 1.00000
x[0.1] = 2.10000, y[0.10] = 0.43171, z[0.10] = 1.00000
x[0.2] = 2.18000, y[0.20] = -0.07596, z[0.20] = 0.87634
x[0.3] = 2.18217, y[0.30] = -0.48765, z[0.30] = 0.64315
x[0.4] = 2.06731, y[0.40] = -0.77241, z[0.40] = 0.32740
x[0.5] = 1.81755, y[0.50] = -0.91012, z[0.50] = -0.03381
x[0.6] = 1.43713, y[0.60] = -0.89610, z[0.60] = -0.39759
x[0.7] = 0.95091, y[0.70] = -0.74318, z[0.70] = -0.72053
x[0.8] = 0.40047, y[0.80] = -0.48080, z[0.80] = -0.96425
x[0.9] = -0.16175, y[0.90] = -0.15140, z[0.90] = -1.10046
x[1.0] = -0.67963, y[1.00] = 0.19549, z[1.00] = -1.11457
```