TALLINN UNIVERSITY OF TECHNOLOGY

SCHOOL OF INFORMATION TECHNOLOGIES

Faculty of Computer Systems

223662MVEB

IAX0583 Programing 2

Homework no.2

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**Signature:**

**Contents**

**Statement of the task ...........................................................................4**

**Algorithm .............................................................................................5**

**Program code .......................................................................................7**

**Output and explanation of the program.............................................9**

**Setting up the task**

**Recursion 25**

Create an algorithm and the corresponding program (in C ) to:

From the 1st keyboard, the real numbers X (⏐X⏐<1) and ε (0<ε<1) are entered;

2. Using a recursive function, a real array A is formed

       elements

A0 = 1,

A1 = – X3/3!,

A2 = X5/5!,

. . .

up to the number of elements L of array A either satisfies the condition ⏐AL – AL – 1 ⏐ ≤ ε or (if this condition is not satisfied) L = 15;

3. The number of the elements of the array A and the elements are output to the file F with their indexes.

# **Explore the processing method to get arument for recursion**

A picture containing text, clock

Description automatically generated

**Algorithm**

Diagram

Description automatically generated

Diagram

Description automatically generated

**Program code:**

**Main:**

#include "functions.h"

#define N 15

int main()

{

float x;

float e;

int elemetCounter = 1;

float arr[N];

arr[0] = 1;

x = inputFloat("Enter x: ");

e = inputFloat("Enter e: ");

elemetCounter = f(x, 1, x, arr, e, elemetCounter);

print(arr, elemetCounter);

return 0;

}

**Functions:**

#include "functions.h"

#include <math.h>

#include <stdio.h>

int f(float current, int i, float x, float arr[], float e, int elementCounter)

{

float new = current \*(-x \* x / 2 / (float)i / (2 \* (float)i + 1));

//debug: printf("i: %d, current: %f\n", i, current);

if (fabs(arr[i] - new) <= e)

{

return elementCounter;

}

else

{

arr[i] = new;

elementCounter++;

f(new, i + 1, x, arr, e, elementCounter);

}

}

void print(float arr[], int elementCounter)

{

FILE \*file = fopen("F.txt", "w");

int i = 0;

for (i = 0; i < elementCounter; i++)

{

fprintf(file, "%f \n", arr[i]);

}

fprintf(file, "Number of elements: %d", elementCounter);

fclose(file);

// for (i = 0; i < elementCounter; i++)

// {

// printf("%f \n", arr[i]);

// }

printf("Success! Check F.txt for results.\n");

}

float inputFloat(char text[])

{

float value;

printf("%s", text);

scanf("%f", &value);

return value;

}

Program input:

Text

Description automatically generated

Program output:

Graphical user interface, text, application, chat or text message

Description automatically generated

Program explenation:

* the program is devided by 2 files, the main and file with functions , which is conected to the main using header (.h) file.
* To get i element recursive function „f“ is used, it calls itself until condition is not satisfied
* Program outputs the result into separate file named F.txt(opened in writing mode) row by row