

W1 NUMERICAL ANALYSIS 2019-2020 FALL

Grading:

Class exercises : %30

Homework exercises %20

Final exam (written in class exam) open book %50

Books:

Numerical Analysis with example programs. M. Turhan ÇOBAN

http://www.turhancoban.com/kitap/NA_with%20example%20problems.pdf

Numerical Methods for Engineers, Steven C.Chapra, Raymond P. Canale, Mc Graw Hill publication

Numerical Analysis, Richard L. Burden J. Douglas Faires, Thomson Brooks/Cole publications

SERIES AND ALGORITHMS

CLASS EXERCISES

Class exercises will be completed and graded in class

1. $\sin(x) = \sum_{k=0}^{\infty} (-1)^k \frac{x^{2k+1}}{(2k+1)!}$
2. $\sin h(x) = \sum_{k=0}^{\infty} \frac{x^{2k+1}}{(2k+1)!}$
3. $\cos(x) = \sum_{k=0}^{\infty} (-1)^k \frac{x^{2k}}{(2k)!}$

Sin(x) function is defined in java,c++, python and octave write them down and run the programs

EX 1

Java version

```
public class sin
{
    public static double sin(double x)
    {double total=0;
    double factorial=1;
    double power=x;
    int plusminus=1;
    int i=0;
    for(int k=1;k<=200;k++)
    {total=total+power/factorial*plusminus;
    power=power*x*x;
    i=2*k+1;
    factorial=factorial*(i-1)*i;
    plusminus*=-1;
    }
    return total;
    }
    public static void main(String arg[])
    { double x=Math.PI/3.0;
    System.out.println("sin = "+sin(x)+" Math.sin = "+Math.sin(x));}
}
```

C++ version

```
#include <stdio.h>
#include <iostream>
#include <math.h>
using namespace std;

double sin1(double x)
{double total=0;
double factorial=1;
double power=x;
int plusminus=1;
int i=0;
for(int k=1;k<=200;k++)
{total=total+power/factorial*plusminus;
```

```

power=power*x*x;
i=2*k+1;
factorial=factorial*(i-1)*i;
plusminus*=-1;
}
return total;
}
int main()
{
    double PI=atan(1.0)*4.0;
    double x=PI/3.0;
    cout<<"sin = "<<sin1(x)<<" Math.sin = "<<sin(x);
}

```

Python version

```

import math;

def sin(x):
    total=0;
    factorial=1;
    power=x;
    plusminus=1;
    i=0;
    for k in range(1,80):
        total=total+power/factorial*plusminus;
        power=power*x*x;
        i=2*k+1;
        factorial=factorial*(i-1)*i;
        plusminus*=-1;
    return total;

pi=math.pi;
x=pi/3.0;
print ("sin="+str(sin(x))+ "math.sin = "+str(math.sin(x)));

```

Octave(matlab) version

Octave editor (write the fuction sin1)

```

function total=sin1(x)
% sin function
total=0;
factorial=1;
power=x;
plusminus=1;
for k=1:100
    total=total+power/factorial*plusminus;
    power=power*x*x;
    i=2*k+1;
    factorial=factorial*(i-1)*i;
    plusminus=-1*plusminus;
end
end

```

Octave command window

```

>> format long
>> x=pi/3
x = 1.047197551196598
>> sin1(x)
ans = 8.660254037844385e-01
>> sin(x)
ans = 8.660254037844386e-01

```

EX2

As a second example write $\cos(x)$ in java,c++, python and octave write them down and run the programs (code is not even to you, but please note that it is very similar to sinüs function)

HOMEWORK EXERCISES

Homework exercises will be done at home and will bring to next Thursday class printed no late exercises will be excepted. Each code should include student name id#, code plus results should be given. Homeworks will be accepted in written format plus a computer copy in pdf format will be sent to numerical_analysis@turhancoban.com adress your file name should be

“group”+“week#”+studentname+studentid#.pdf

A_W1_turhan_coban_0101333.pdf

B_W3_ali_veli_02335646.pdf

W1HW1 : write arcsin(x) in java,c++, python and octave write them down and run the programs

$$1. \arcsin(x) = \sum_{k=0}^{\infty} \frac{(2k)!x^{2k+1}}{(2^k k!)^2 (2k+1)} \quad x^2 \leq 1$$

W1HW2 : write erf(x) in java,c++, python and octave write them down and run the programs

$$2. \operatorname{erf}(x) = \frac{2}{\sqrt{\pi}} \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{n!(2n+1)}$$