

# TU Berlin, Scientific Computing, WS17/18

## Homework assignment #1

October 26, 2017

Please return this assignment by by Wednesday, Nov. 8. Send it in form of a compressed (zip, tgz, bz2, ...) file by e-mail to [juergen.fuhrmann@wias-berlin.de](mailto:juergen.fuhrmann@wias-berlin.de) which contains a subdirectory with

- the C++ source code (one main program for each part)
- a pdf describing your answer.

Please prefix file and subdirectory names with your last names, e.g. “Mueller-Nguyen-HW01.tgz”.

### 1 First program

Set up a C++ compiler and write a program which prints “Hello world”. For writing the program, you will need a text editor.

- Linux: g++ and clang++ can be installed using the package manager of the system
- MacOSX: you will need the Xcode development environment
- Windows: The best option seems is to set up cygwin (<https://www.cygwin.com/>) unix environment which provides g++, python etc.

### 2 Machine epsilon

Write a program in C++ which calculates the smallest positive number  $\epsilon$  such that  $1 + \epsilon > 1$  and reports this value for the types float, double and long double.

- When using printf, take care to use the proper format specifications for the different data types
- When printing the values, please use format specifications resp. io manipulators which guarantee that you print enough digits to represent the calculated value, e.g.:

```
double d;
printf("d= %22.17e\n",d);
std::cout << "d="<<std::setprecision(20) << d << std::endl;
```

### 3 Summation

Write a C++ program which calculates  $\sum_{n=1}^K \frac{1}{n^2}$  for  $K = 10, 100, 1000, 10000, 100000$  and reports the values.

Compare the results to the value of  $\sum_{n=1}^{\infty} \frac{1}{n^2}$  (hint: look it up under “Basel problem”).

What can be done in order to improve the accuracy of the calculation ?