QF633 Assignment 1

Exercise 1

Implement the same functionality that the example code "konno.c" achieves in a human readable way. Your code should check the validity of the input and should not crash for empty argument.

Submit `ex1.cpp` file that contains implementation. Paste your implementation and test case in the document `assignment1.pdf`.

Exercise 2

a) Write a function to very if an integer is a prime number:

```
bool isPrime(int m)
```

b) Write a function to verify Goldbach's conjecture,

```
void goldbach(int m)
```

i.e., every even integer greater than 2 can be expressed as the sum of two primes. If it succeeds finding at least one pair of primes, print them out and terminate finding, otherwise print a message saying that you have found a counterexample for the conjecture (which is extremely unlikely). The function throws an exception if the input number is not a positive even integer.

Submit `ex2.cpp` file that contains implementation of the above functions and a `main` function that take an user input and verify the conjecture. Paste your implementation and test case in the document `assignment1.pdf`.

Exercise 3

There are many infinite series for approximating π. Implement three of them:

(a) `double Pi1(int nTerm)`: $\pi = 4 \sum_{k=0}^{nTerm} (-1)^k \frac{1}{2k+1}$, use `recursion`

(b) `double Pi2(int nTerm)`: $\pi = 3 + 4 \times \sum_{k=1}^{nTerm} (-1)^{k-1} \frac{1}{2k \times (2k+1) \times (2k+2)}$, use `while` loop

(c) `double Pi3(int nTerm)`:

$$\pi = 4(4 \arctan \frac{1}{5} - \arctan \frac{1}{239}), \quad \text{where} \quad \arctan x = \sum_{k=0}^{nTerm} \frac{(-1)^k}{2k+1} x^{2k+1}$$

use `do..while` loop.

Submit `ex3.cpp` file that contains implementation of above three function, and a `main` function that takes a user input of `nTerm`, and print out the error of the three approximation against the constant:

```
const double PI = 3.14159265358979323846;
```

An exception should be thrown in each `Pi` function if the user input is invalid. Paste your implementation and test case in the document `assignment1.pdf`.

Submission Checklist

Paste all your implementation and test results in a PDF document `assignment1.pdf`, zip the below files and name it as `Assignment1_YourName.zip` and submit to eLearn.

`ex1.cpp` `ex2.cpp` `ex3.cpp` `assignment1.pdf`