## EE231002 Introduction to Programming

Lab02. Approximating  $\pi$ 

## Due: Sep. 24, 2019

The following equation has been proven and as the number of terms approaches infinite it converges to value shown on the right side of the equation.

$$\frac{1}{2 \cdot 3 \cdot 4} - \frac{1}{4 \cdot 5 \cdot 6} + \frac{1}{6 \cdot 7 \cdot 8} - \dots = \frac{1}{4}(\pi - 3).$$

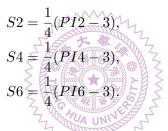
The aim of this lab is to verify the above equation, we define

$$S2 = \frac{1}{2 \cdot 3 \cdot 4} - \frac{1}{4 \cdot 5 \cdot 6},$$
  

$$S4 = \frac{1}{2 \cdot 3 \cdot 4} - \frac{1}{4 \cdot 5 \cdot 6} + \frac{1}{6 \cdot 7 \cdot 8} - \frac{1}{8 \cdot 9 \cdot 10},$$
  

$$S6 = \frac{1}{2 \cdot 3 \cdot 4} - \frac{1}{4 \cdot 5 \cdot 6} + \frac{1}{6 \cdot 7 \cdot 8} - \frac{1}{8 \cdot 9 \cdot 10} + \frac{1}{10 \cdot 11 \cdot 12} - \frac{1}{12 \cdot 13 \cdot 14}.$$

Given the partial sums, then we can find the approximated value of  $\pi$  as below.



As the number of terms increases, the value of PIn should approach  $\pi$ . Your assignment is to write a C program to calculate PI2, PI4, PI6, PI8, PI10 and PI12. The output of you program should have the following format.

\$ ./a.out
PI2 = 3.13333
PI4 = x.xxxxx
PI6 = x.xxxxx
PI8 = x.xxxxx
PI10 = x.xxxxx
PI12 = x.xxxxx

## Notes.

- 1. Create a directory lab02 and use it as the working directory.
- 2. Name your program source file as lab02.c.

3. The first few lines of your program should be comments as the following.

```
// EE231002 Lab02. Approximating Pi
// ID, Name
// Date
```

4. After finishing editing your source file, you can execute the following command to compile the program,

\$ gcc lab02.c

If no compilation errors, the executable file, **a.out**, should be generated, and you can execute it by typing

\$ ./a.out

5. After you finish verifying your program, you can submit your source code by

 $\sim ee2310/bin/submit lab02 lab02.c$ 

If you see a "submitted" message, then you are done. In case you want to check which file and at what time you submitted your labs, you can type in the following command:

 $\sim ee2310/bin/subrec lab02$ 

It will show the last few submission records.

6. (Challenge, no submission is required.) Since this is a convergent series, the approximation should approach  $\pi$ . You are encouraged to find the value of  $\pi$  as accurate as possible.

