EE231002 Introduction to Programming

Practice Lab. Pi and sine function

No due date.

The number π is known to be an irrational number and cannot be expressed exactly in decimal format. The decimal value, however, can be approximated. Many approximation formulae have been developed. One of them is shown below.

$$\frac{\pi - 3}{4} = \frac{1}{2 \cdot 3 \cdot 4} - \frac{1}{4 \cdot 5 \cdot 6} + \frac{1}{6 \cdot 7 \cdot 8} - \frac{1}{8 \cdot 9 \cdot 10} + \frac{1}{10 \cdot 11 \cdot 12} - \frac{1}{12 \cdot 13 \cdot 14} + \ldots \qquad (21.1)$$

Though not the most accurate, we assume the value of π can be calculated using the 6-term series on the right hand side.

The trigonometric function $\sin(x)$ can also be approximated using infinite series as shown below.

$$\sin(x) = \sum_{k=1}^{\infty} \frac{(-1)^{k-1} x^k}{k!} \qquad (21.2)$$

$$= x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots \qquad (21.3)$$

For this lab, we assume $\sin(x)$ can be approximate accurately using 4-term series as above.

In this lab, please write a `C` program to find the value of π and $\sin(\frac{\pi}{6})$. The output of the program should be as following:

```
$ ./a.out
pi = x.xxxxx
sin(pi/6) = x.xxxxxx
```

Notes.

1. Create a directory **lab21** and use it as the working directory.

2. Name your program source file as **lab21.c**.

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

   ```
   /* EE231002 Lab21. PI and sine function
      ID, Name
      Date:
   */
   ```

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

    $ `gcc lab21.c`

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

    $ `./a.out`

5. There is no need to submit your program for this lab. It is only for your own practice.

6. Since loops have not been covered yet, do not use loops in this lab. And because no loops, program efficiency is not the best. Thus, for this lab only, the efficiency is not emphasized.