CS19001: Programming and Data Structures Laboratory

Soumyajit Dey, Aritra Hazra;
CSE, IIT Kharagpur

http://cse.iitkgp.ac.in/~aritrah/course/lab/PDS/Autumn2018/CS19101_PDS-Lab_Autumn2018.html

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Soumyajit Dey, Aritra Hazra; CSE, IIT Kharagpur

Programming Assignments

Complete and submit during lab

Assignment 1

Soumyajit Dey, Aritra Hazra; CSE, IIT Kharagpur

Write a program which will take as input an integer x and print out the value of $x!$, factorial of x. We will like to compute factorial of reasonably large integers, say 10, 11, etc.

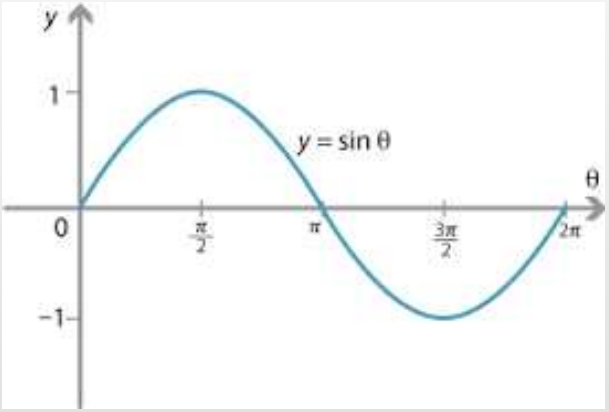
However, say 15! cannot be stored in a 32-bit integer data type, so for computing factorial, use "double" as a data type and avoid errors.

Assignment 2

Write a program which performs the following.

- requests the user for an integer i.
- prints out the value of sin function inside the interval $[0, 2\pi]$ at $i + 1$ uniformly placed points.
- use float as a data type for input and double as a data type for output of sin function (math.h).
- Use "M_PI", a constant defined in math.h as the value of π. You can directly use it in your code as it is already defined in the header file.

Assignment 2: Expected Output




```
Enter resolution:  6
sin(0.00 pi)= 0.000000
sin(0.33 pi)= 0.866025
sin(0.67 pi)= 0.866025
sin(1.00 pi)= -0.000000
sin(1.33 pi)= -0.866025
sin(1.67 pi)= -0.866025
sin(2.00 pi)= 0.000000
```

Assignment 3

Ask the user to provide a resolution r which is any float value (preferably smaller than 0.0004). Modify the previous program as follows.

- Stop using the math.h sin function. Note that $sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \frac{x^9}{9!} - \cdots$
- Implement a loop for computing the above series where in each iteration one term is +/-
- Break out of loop when the difference between the partial sums computed in the last two iterations is $< r$.
- suppose, $a = x - \frac{x^3}{3!} + \frac{x^5}{5!}, b = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!}$ and $|a - b| \leq r$, then break from loop and report $[a, b]$ as approximate value of sin(x) if $a \leq b$ or $[b, a]$ if $b < a$.

Assignment 3 : Useful Hints

- For safe handling of precision, use “double” as data type.
- Use fabs() function from math.h for computing modulus.

Assignment 3: Expected Output

```
Enter resolution:  6
Enter Interval size:  0.0004
sin(0.00 pi)= 0.000000
my sin(0.00 pi)= [0.000000, 0.000000]
sin(0.33 pi)= 0.866025
my sin(0.33 pi)= [0.866021, 0.866295]
sin(0.67 pi)= 0.866025
my sin(0.67 pi)= [0.866023, 0.866108]
sin(1.00 pi)= -0.000000
my sin(1.00 pi)= [-0.000001, 0.000021]
sin(1.33 pi)= -0.866025
my sin(1.33 pi)= [-0.866126, -0.866020]
sin(1.67 pi)= -0.866025
my sin(1.67 pi)= [-0.866049, -0.865672]
sin(2.00 pi)= 0.000000
my sin(2.00 pi)= [-0.000005, 0.000083]
```

Thank You