

Deadline

Wed May 5 17:00:00 GMT-8 2004

Learning Keywords

gcc, make, long, long double, printf, loops, floating point arithmetic, overflow.

Your Task

In this assignment you are required to implement a C program that calculates π using the formula:

$$\pi = 2 \prod_{n=1}^{\infty} \frac{(2n)^2}{(2n-1)(2n+1)}$$

$$\pi = 2 \cdot \frac{2 \cdot 2}{1 \cdot 3} \cdot \frac{4 \cdot 4}{3 \cdot 5} \cdot \frac{6 \cdot 6}{5 \cdot 7} \cdots$$

The formula above computes the value of π as a product of infinite number of terms. Each additional term increases the accuracy of the computed value. Your program should

- Approximate π by multiplying 1,000,000,000 terms using a loop.
- Print out the value computed so far up to 50 decimal places after every 100 iterations.
- Use type `unsigned long` for variable n above in your program to avoid overflows, and use a variable of type `long double` to store the computed value of π .

Submission Requirement

Make sure you have read the submission instruction document posted on CS2281 website. For this assignment, create a subdirectory under `$HOME/CS2281_LABS/` called `a1` and put all your submissions under the subdirectory. You are required to submit the C program which must be named `pi.c` and the `Makefile` you used to compile `pi.c`. Include your name as a comment in the *first* line of the file. I will access your homework using pathname `$HOME/CS2281_LABS/a1/pi.c.pgp` and `$HOME/CS2281_LABS/a1/Makefile.pgp`. It is your responsibility to make sure that the filenames are correct and permissions are set properly according to the instructions given.

Additional Tips

- Make sure when you compute the term $\frac{(2n)^2}{(2n+1)(2n-1)}$ operator, it is performing floating point arithmetic instead of integer arithmetic. You should be careful so that the intermediate results do not overflow as well.
- Check man page for `printf` or google to find out how to print a long double.